

Perspectives

Physical activity promotion in German vocational education: does capacity building work?

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Summary

Apprentices in many sectors are exposed to increased health risks and show low levels of physical activity (PA). Environmental and policy approaches seem to be promising tools for PA promotion as they can positively influence the context in which PA occurs. This article reports results from a German research project (2015–2018) that developed and implemented measures for PA promotion in the field of vocational education (VE). A participatory approach—cooperative planning (COP)—involving researchers as well as stakeholders from policy and practice was used in two VE settings—nursing care and automotive mechatronics. We assessed the extent to which new capacities for PA promotion were created by conducting semi-structured interviews with stakeholders from both sectors ($n=12$) and one group interview with nursing students ($n=4$). Transcripts were analysed using qualitative content analysis. Findings show that new capacities were created mainly in the form of resources and opportunities and that several measures for PA promotion (e.g. a regular lesson on the issue of PA and health and a tutoring system) were successfully integrated into VE routines. However, establishing new organizational goals and obligations appeared to be challenging. Moreover, the article presents influencing factors, such as the participation of the main actors that strongly supported the process of capacity building within their organization. We conclude that COP seems promising in creating new capacities for PA promotion in the field of VE, and therefore has the potential to promote a physically active lifestyle among apprentices.

Key words: cooperative planning, participation, apprentice, active lifestyle

INTRODUCTION

Vocational education (VE) marks the starting point for a professional career in many fields. In Germany, VE is organized in a dual system that includes part-time learning at vocational schools combined with practical training within a company (Deissinger, 2010). Automotive mechatronics and nursing care are among the most

popular professions chosen by young adults in German VE. According to the Federal Statistical Office, automotive mechatronics is particularly popular among males (DESTATIS, 2017), while nursing is dominated by female employees (Wirth *et al.*, 2016). However, as outlined by several authors, apprentices of both professions are exposed to increased health risks. In a large-scale

study including more than 3,500 apprentices from the motor industry, [Betz et al. \(2012\)](#) found high prevalence rates of issues such as back pain (58%) and headaches (45%). In the nursing-care sector, a survey with 1119 students revealed comparable results, with around 50% of apprentices suffering from back pain or headaches at least once per week ([Bomball et al., 2010](#)).

Against this backdrop, it seems important to put a stronger focus on the health behaviour of the young people who represent the ‘professionals of tomorrow’. As physical activity (PA) has the potential to make a substantial contribution to individuals’ health (e.g. [Warburton and Bredin, 2017](#)), the promotion of a physically active lifestyle is also considered a promising strategy to maintain or improve health among apprentices ([Walter et al., 2013](#)). However, two studies have demonstrated that 42% of apprentices in automotive mechatronics ([Betz et al., 2012](#)) show low PA levels and that 29% of apprentices from the nursing sector ([Lehmann et al., 2014](#)) are physically active less than once a week. This is in line with a study by [Kaminski et al. \(2008\)](#), who also postulated a great need for PA promotion in the mechanical and social professions of VE.

Promoting PA and long-term adherence to a physically active lifestyle is a challenging task, and the debate on the most appropriate approaches is still ongoing ([Brown et al., 2012](#); [Abu-Omar et al., 2017](#)). Ecological models (e.g. [Bauman et al., 2012](#)) specify different classes of determinants of PA, such as individual, environmental and regional ones. The PARC-AVE project addresses both individual (e.g. Physical Activity-related Health Competence) and environmental determinants of PA ([Rütten et al., 2019](#)). The present article, however, takes a primarily environmental perspective. The literature indicates that effective changes to health behaviour require supportive policies and environments ([Sallis et al., 1998](#); [Kahn-Marshall and Gallant, 2012](#); [Sallis and Owen, 2015](#)). Apprentices spend substantial parts of their time at vocational school or in their VE companies. We assume that working with these organizations is an appropriate starting point as they (i) shape apprentices’ working and learning environment and (ii) allow for reaching a large number of individuals as attendance is compulsory. Therefore, we expect that creating activity-friendly educational and working environments together with the VE organizations can have a substantial impact on apprentices’ PA behaviour.

Several authors have highlighted ‘capacity building’ as important for achieving sustainable health-promotion effects ([Crisp et al., 2000](#); [NSW Health Department, 2001](#); [Schell et al., 2013](#)). Capacity building is defined as the ‘development of knowledge, skills, commitment, structures and leadership to enable effective health

promotion’ [([Smith et al., 2006](#)), p. 341]. The term ‘can be applied to interventions which have changed an organization’s or community’s ability to address health issues by creating new structures, approaches and/or values’ [([Crisp et al., 2000](#)), p. 100]. In other words, capacity building may enable organizational change to target a particular health issue, such as insufficient PA.

[Bergeron et al. \(2017\)](#) identified several underlying theories, models and frameworks used in this context. Of these, we chose the ADEPT model ([Rütten et al., 2010](#)) to guide the operationalization and measurement of capacities in this study. The model includes four basic capacities—*goals, obligations, resources and opportunities*—that influence policy and organizational development in health promotion ([Rütten and Gelius, 2014](#)). The potential impact of these capacities is described by the terms *output* and *outcome*. Output is, for example, a change in structures and processes. In our study, we interpreted the integration of PA promotion measures into VE programmes as outputs resulting from successful capacity building. Outcome refers to changes in attitude and/or behaviour among the target group. In the context of VE, examples could be an increased awareness of the health-enhancing effects of PA or increased PA levels among apprentices.

This article reports findings from the PARC-AVE project (Physical Activity-related Health Competence in Apprenticeship and Vocational Education), which aimed to promote PA among apprentices through capacity building as well as the associated development and implementation of PA-promoting measures. PARC-AVE is part of Capital4Health, a transdisciplinary consortium of research projects that all utilize the participatory approach of cooperative planning (COP) ([Rütten, 1997](#)) to promote active lifestyles in different settings across the life course ([Rütten et al., 2019](#)). We adopted the COP approach to build capacities in automotive mechatronics and nursing care, thus achieving organizational change to facilitate the implementation of PA promotion in the two VE settings. Two COP processes (outlined in the Intervention method section) were conducted, resulting in the development and implementation of several new, setting-specific measures for PA promotion in VE. We used semi-structured qualitative interviews to assess to what extent this contributed to the creation of new capacities and whether the developed measures were successfully integrated into VE routines in the two settings.

MATERIALS

Intervention method

[Table 1](#) provides an overview of the two COP processes conducted in PARC-AVE. As initial steps (A and B), two

VE centres were contacted and informed about the purpose of the project, first in August 2013 before filing the project proposal and then again following the positive decision for funding in March 2015. The VE centre for health professions offers eight different training programmes for 500 apprentices; of these, 170 are enrolled in the nursing programme. The VE centre of the automotive manufacturer offers 18 different training programmes for 1600 apprentices, 250 of which are part of the automotive mechatronics programme. Informational meetings (C) at each VE centre were used as a next step to (i) inform potential participants about the project idea, contents and the COP approach and (ii) identify structures, processes and relevant stakeholders within the VE settings (for detailed information about the participants see Table 1). Following this, the involved actors gave their informed consent for participation in the project. With the help of the responsible contact persons (*Nursing setting*: director of the nursing education programme; *Automotive setting*: occupational physician), all relevant stakeholders were invited to participate. An explorative situation analysis, based on both qualitative and quantitative methods (interviews, document analysis and questionnaires), was employed to acquire relevant information regarding the context and the needs of the target group (D).

A separate planning process with stakeholders representing specific roles was conducted for each setting (E). The final selection of stakeholders resulted from the expertise of the contact persons and the group discussions during the first informational meetings. The main intention was to involve a diverse set of stakeholders relevant to the development and implementation of PA-promoting measures from different organizational sub-divisions within the two VE settings (e.g. instructors and teachers). Both planning processes followed a common ruleset and involved six steps (i–vi) spread across four meetings. According to the COP approach, these meetings are intended to provide a platform for knowledge exchange and interaction among researchers, practitioners and policymakers (Rütten, 1997). We took structured minutes of all meetings, which showed that participation varied from 17 to 22 individuals per meeting in the nursing setting and 10 to 14 in the automotive setting. Stakeholders conjointly developed, specified and agreed upon a range of new measures for PA promotion in each setting, which were documented in an action plan. Examples include a dedicated lesson on PA and health for nursing students and a tutoring system for automotive apprentices. An overview of all developed measures is provided in Table 2. Please note that the measures had not been implemented yet at this time. Following the finalization of the action plans, the stakeholders themselves oversaw the implementation of the planned

measures in their respective VE centres (Table 1, F). The researchers accompanied the entire process, moderated the meetings and provided scientific evidence and supporting information where necessary (e.g. contact persons from service providers with scientific qualifications or from health insurance companies).

Evaluation methods

Twelve semi-structured interviews and one group interview were conducted to assess COP-related capacity building in the two settings. To ensure a high evaluation quality, the COREQ checklist (Tong et al., 2007) was used to guide the description of the qualitative research process.

As aforementioned, we used the ADEPT model (Rütten et al., 2010) to operationalize and assess capacities. We developed a theory-based interview guideline based on the four capacity dimensions (*goals, obligations, resources and opportunities*) as well as *output and outcome*. We also included questions to evaluate participants' perception of the COP processes.

In each setting, we selected for interviews six stakeholders who were participants in the COP group and contacted them via e-mail. To better grasp the perspective of the target group and offer them an open space for exchanging experiences, we also conducted one group interview with four nursing students. The positions of the contacted persons are listed below [m = male, f = female]. All agreed to participate in the study, but one did not consent to the recording of the interview and was therefore excluded from the analysis.

Study participants in the nursing setting (set1)	
Headmaster [m]	(1_set1)
Director of the nursing education programme [m]	(2_set1)
Head of the school subject nursing [m]	(3_set1)
Teacher [m]	(4_set1)
Teacher [f]	(5_set1)
Works council of the allied hospital [f]	(6_set1)
Nursing student [m] ^a	(7_set1)
Nursing student [m] ^a	(8_set1)
Nursing student [f] ^a	(9_set1)
Nursing student [f] ^a	(10_set1)
Study participants in the automotive setting (set2)	
Director of the VE centre [m]	(1_set2)
Head of the automotive education sector [m]	(2_set2)
Instructor [m]	(3_set2)
Youth trainee representative [m]	(4_set2)
Occupational physician [f]	(5_set2)
Workers council [m] ^b	(6_set2)

^aGroup interview participant.

^bDid not consent to recording, therefore not included in analysis.

Table 1: COP processes in the two VE settings of the PARC-AVE project

Steps							
A)	Contacting (i) the VE centre for health professions and (ii) the health department of a German automotive manufacturer and its VE centre for automotive mechatronics (August 2013)						
B)	Contacting and informing VE centres in both settings again after a positive funding decision by the German Federal Ministry of Education and Research (March 2015)						
C)	First information meetings in both settings: identification of structures, processes and relevant stakeholders						
	<table border="1"> <thead> <tr> <th>Nursing setting</th> <th>Automotive setting</th> </tr> </thead> <tbody> <tr> <td>10.06.2015, 7 participating actors</td> <td>11.04.2015, 8 participating actors</td> </tr> <tr> <td> <ul style="list-style-type: none"> • Scientific director • Scientists • Headmaster • Nursing director of the clinic • Director of the nursing education programme • Head of the school subject nursing </td> <td> <ul style="list-style-type: none"> • Scientific director • Scientists • Head of the health department • Occupational physician • Director of the VE centre • Head of the automotive education sector • Instructor </td> </tr> </tbody> </table>	Nursing setting	Automotive setting	10.06.2015, 7 participating actors	11.04.2015, 8 participating actors	<ul style="list-style-type: none"> • Scientific director • Scientists • Headmaster • Nursing director of the clinic • Director of the nursing education programme • Head of the school subject nursing 	<ul style="list-style-type: none"> • Scientific director • Scientists • Head of the health department • Occupational physician • Director of the VE centre • Head of the automotive education sector • Instructor
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D)	Detailed explorative situation analysis in both settings (April 2016–January 2017)						
E)	COP in both settings: development, specification and agreement of measures for PA promotion						
	<table border="1"> <thead> <tr> <th>Nursing setting</th> <th>Automotive setting</th> </tr> </thead> <tbody> <tr> <td>Four COP meetings (15.07.2016, 12.09.2016, 12.10.2016, 16.11.2016), 17–22 stakeholders per meeting</td> <td>Four COP meetings (25.07.2016, 06.10.2016, 27.10.2016, 19.12.2016), 10–14 stakeholders per meeting</td> </tr> <tr> <td> <ul style="list-style-type: none"> • Scientific director^a • Scientists^a • Headmaster^b • Nursing director of the clinic^b • Workers council^a • Disability representative^b • Director of the nursing education programme^a • Head of the school subject nursing^a • Teachers^a • Health insurance representative^b • Nursing students^a • Student assistants^a </td> <td> <ul style="list-style-type: none"> • Scientific director^a • Scientists^a • Workers council^a • Occupational physician^a • Director of the VE centre^a • Head of the automotive education sector^a • Company health insurance representative^a • Coordinator of projects for apprentices^b • Instructor^b • Apprentice^b • Youth trainee representatives^b • Assistant to head of department^b • External service provider (sports)^a • Student assistants^a </td> </tr> </tbody> </table>	Nursing setting	Automotive setting	Four COP meetings (15.07.2016, 12.09.2016, 12.10.2016, 16.11.2016), 17–22 stakeholders per meeting	Four COP meetings (25.07.2016, 06.10.2016, 27.10.2016, 19.12.2016), 10–14 stakeholders per meeting	<ul style="list-style-type: none"> • Scientific director^a • Scientists^a • Headmaster^b • Nursing director of the clinic^b • Workers council^a • Disability representative^b • Director of the nursing education programme^a • Head of the school subject nursing^a • Teachers^a • Health insurance representative^b • Nursing students^a • Student assistants^a 	<ul style="list-style-type: none"> • Scientific director^a • Scientists^a • Workers council^a • Occupational physician^a • Director of the VE centre^a • Head of the automotive education sector^a • Company health insurance representative^a • Coordinator of projects for apprentices^b • Instructor^b • Apprentice^b • Youth trainee representatives^b • Assistant to head of department^b • External service provider (sports)^a • Student assistants^a
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Roles	<ul style="list-style-type: none"> • Researchers: moderation, scientific evidence, information about possible PA promotion measures • Stakeholders: ideas for PA promotion, interests and wishes, exchange on opportunities within the given organizational context 						
Rules	<ul style="list-style-type: none"> • Equal rights of all participants • Open discussion culture • All propositions relevant and valuable • No rash or one-sided definition of measures • Room for reflection of ideas 						
Process	<ol style="list-style-type: none"> Brainstorming of goals and propositions Categorization of goals and propositions Prioritization of goals and propositions 						

(continued)

Table 1: (Continued)

Steps	
	iv. Development and definition of concrete measures
	v. Specification of measures, definition of necessary steps and responsibilities in an action plan
	vi. Initiation of measures
F)	Implementation of the planned measures under the direction of the VE centres (after the last COP meetings in November/December 2016)

^aHigh level of participation (present at three/four meetings).

^bLow level of participation (present at one/two meetings).

Table 2: Description of the developed measures for PA promotion

Measures for PA promotion	
Nursing setting	
BUG lesson (Ger.: 'Bewegt und Gesund-Stunde'; Eng.: 'PA and health lesson')	Weekly 90-min lesson during regular school hours in each class covering the theory and practice of PA and health
Toolbox	PowerPoint presentation for active breaks with instructions for strength, coordination and concentration exercises
Preserving position of a physical education teacher	Recruitment of a new physical-education teacher after the retirement of the current teacher
Information for teachers	Information about the project and the developed measures during a teachers' conference
Trainer qualification for teachers	Teachers participate voluntarily in a workshop that qualifies them to conduct the BUG lesson
Trainer qualification for students	Students participate voluntarily in a workshop that qualifies them to guide physical exercises
Adaptation of mission statement	PA as part of the mission statement of the VE centre
Automotive setting	
Tutoring system	Apprentices participate voluntarily in a workshop to enable them to act as tutors to promote PA and health among their peers
Instructor workshop	Automotive mechatronic instructors participate in a workshop on the subject of PA and health
Adaptation of 'Fit & Healthy Workshop'	Integration of an additional section on PA and health into an existing workshop for first-year apprentices
Information for instructors	Information about health-enhancing PA and tutoring workshop in the context of a quarterly instruction
Creation of PA opportunities	Opportunities for PA in the education and working environment of apprentices, e.g. slots for PA in everyday work routine, adaptation of morning exercises at the apprentices' workplace
Adaptation of works agreement	PA as part of the works agreement of the VE centre
Adaptation of mission statement	PA as part of the mission statement of the VE centre

Based on the action plans. Note that the measures had not been implemented yet at this time. Implementation only began after the finalization of the action plans (see [Table 3](#) for status of implementation).

The first two authors (J.P. [f] and J.C. [m])—both research associates, MSc) discussed the interview guideline with the project team (J.P., J.C., E.G. [f] and K.P. [m]) and conducted the interviews between November and December 2017. The first author has a sport-science and

public-health background, while the second has a background in sport science and psychology. The investigators had no relationship with the participants. One interview per participant was conducted. Interviews invariably took place at the participant's workstation and only the

interviewer and the interviewee were present. Before the interviews started, interviewees were provided with written information about the study design and their rights as interview partners. Subsequently, they gave their written consent to participate in the study.

All interviews except one—where the interviewee did not grant consent—were audio-recorded and lasted between 21 and 72 min. The interviewer took notes during and after the interviews. We formulated a transcription guideline based on recommendations by [Dresing and Pehl \(2015\)](#). As our exclusive interest was in the contents of the interviews, we chose a verbatim transcription using the software *f4transkript Ver.5.7*. For reasons of anonymity, we substituted working positions for person names and pseudonyms for company, institution and city names.

The transcripts were analysed using qualitative content analysis ([Kuckartz, 2016](#)). This method involved a deductive definition of main categories based on the interview guideline and an inductive definition of subcategories based on the transcribed material. Data analysis comprised the following steps: (i) initial text analysis, (ii) developing main thematic categories, (iii) coding of the entire data using the main categories, (iv) compiling all coded text passages with the same main category, (v) inductive definition of subcategories based on the material, (vi) coding of the entire data using the refined category system and (vii) evaluation and interpretation ([Kuckartz, 2016](#)). *MAXQDA Ver.18* was used for data coding and analysis.

As main categories, we defined the four capacity dimensions *goals*, *obligations*, *resources* and *opportunities*, the two impact dimensions *output* and *outcome*, and the additional categories *cooperative planning*, *facilitators* and *barriers* ([Table 3](#)). Two members of the research team (J.P. and E.G.) developed and double-checked the category system by using a codebook with definitions of each category and subsequently applied it to the interview transcripts. Inconsistencies were discussed and resolved within the team.

RESULTS

The qualitative content analysis resulted in 597 codings. *K*-values of the single interviews, which indicate overlaps between the coders, were between 0.42 and 0.78. On this basis, inter-coder reliability can be interpreted as moderate/good ([Altman, 1999](#)). Besides our main categories, we identified 32 subcategories for each setting ([Table 3](#)). The most frequently coded categories are presented in the following sections.

Capacities for PA promotion

We found that capacities were built in both settings mostly in the form of newly created or improved *resources* and *opportunities*. Interviewees stated numerous personnel-related, temporal, spatial and financial resources that had changed during COP. Examples are the appointment of a new contact person for PA promotion, the provision of time and rooms for the implementation of measures, as well as newly acquired knowledge about funding opportunities for the tutoring system by a health insurance company.

Moreover, newly created opportunities were mentioned in the interviews, such as new cooperation with external partners (e.g. the trainer of a local fitness centre), support from colleagues or directors and an increased awareness of the issue of PA and PA promotion among the involved stakeholders.

We discuss the topic of physical activity with a different focus. [...] I discuss with colleagues/we sit together more often each week in the team meetings and that has a different importance.

(2_set2)

Only a few text passages were coded regarding *goals* or *obligations*. Therefore, no subcategories were defined for these main categories.

So it [goal] was formulated [...] that we said we simply want to make it [PA/PA promotion] visible, part of everyday life.

(5_set2)

Regarding impact on the VE structure, some of the aforementioned measures were successfully integrated into the routines of the two settings, while the implementation of others was at least planned at the time of the interviews. [Table 3](#) (category *output*) shows the overall implementation status. Among the measures already implemented at the time of the interviews, the BUG lesson (German: 'Bewegt und Gesund-Stunde'; English: 'PA and health lesson') in the nursing setting and the tutoring system in the automotive setting were most frequently mentioned. The integration of the BUG lesson into the routines of the nursing school was made possible by modifying the timetable. During the pilot phase, the lesson was given by an external fitness instructor, who was, however, not available on a regular basis. To allow the sustained integration of the BUG lesson, the nursing teachers themselves proposed to undergo a qualification process as trainers. In the automotive setting, an NGO from the field of health sport and exercise therapy (DVGS; German: 'Deutscher Verband für Gesundheitssport und Sporttherapie') specifically created and conducted a tutoring workshop for the apprentices. After the workshop, participants acted as

Table 3: Category system

Main categories	Subcategories	
	Nursing setting	Automotive setting
Output (developed measures for PA promotion)	BUG lesson ^a Toolbox ^a Information for teachers ^a Trainer qualification for teachers ^b Preserving position of a physical-education teacher ^c Adaptation of mission statement ^c Trainer qualification for students ^d	Tutoring system ^a Information for instructors ^a Adaptation of 'Fit & Healthy Workshop' ^b Instructor workshop ^b Creation of PA opportunities ^d Adaptation of works agreement ^d Adaptation of mission statement ^d
Goals	<i>No subcategories</i>	
Obligations	<i>No subcategories</i>	
Resources	Personnel-related resources Temporal resources Spatial resources Financial resources	
Opportunities	New cooperation Support Attitude	
Outcome	Awareness of the issue Change of PA behaviour Change of attitude towards PA	
COP	Attendance Involvement Scheduling meetings Evaluation Main actors	
	Nursing setting	Automotive setting
Facilitators	Positive attitude (students and teachers) Support from individuals High relevance of the topic	Positive attitude (directors and instructors) Support within the company Peer-to-peer approach Favourable financial resources
Barriers	Negative attitude (students and teachers) Difficult integration into lessons/curriculum Low relevance of the topic Limited personnel resources Limited temporal resources Limited spatial resources Limited financial resources	Negative attitude (apprentices) Difficult integration into vocational training Low support within the company Limited temporal resources Limited financial resources Low relevance of the topic

^aImplemented.

^bImplementation planned and carried out after the end of the evaluation phase.

^cImplementation planned.

^dImplementation status unclear.

tutors for their peers in the company's VE programme. According to the interviewees, acceptance rates were high for both the BUG lesson and the tutoring system.

The feedback of the students was very good [...] I am pleasantly surprised that it [BUG lesson] was so well accepted by the students.

(2_set1)

In the nursing setting, a toolbox with instructions for active breaks was developed. Implementation was initially successful but could not be sustained.

It [Toolbox] was very good at the beginning but it is not used much anymore. We have to reactivate that a little bit.

(3_set1)

Other measures were still at the planning stage at the time of the interviews (e.g. the aforementioned trainer qualification for nursing teachers), though some of them have since been implemented. We also found that the implementation status of some measures was unclear, for example the adaptation of the works agreement in the automotive setting, and the trainer qualification for students in the nursing setting. In this context, we found that interviewees had varying levels of knowledge about the status of the developed measures.

At the level of potential impact, we also asked for changes among the apprentices regarding their PA behaviour and attitudes towards PA (*outcome*). Although recognizing during interviews that this question was challenging to answer, some interviewees highlighted the positive effects of the previously mentioned measures.

Some of them [nursing students] are now participating in sports activities [outside school] as an effect of this measure [BUG lesson].

(3_set1)

Cooperative planning

According to the interviewees, almost all relevant stakeholders attended the COP meetings; only one political stakeholder was invited but unable to join in the nursing setting.

Some interviewees, especially the nursing students themselves, highlighted the opportunity for active participation during the meetings. In contrast, the occupational physician in the automotive setting critically reflected on the limited active participation of the attending apprentices in COP discussions. Another challenge in this setting was the scheduling of planning meetings.

Nevertheless, the COP approach was considered effective in terms of creating measures for PA promotion. As the head of the school subject nursing emphasized:

I do not see what could have been more effective. [...] this method to involve these actors themselves was the most important thing for me. And if it had not been like that, it would have failed.

(3_set1)

To gain a deeper insight into the processes underlying the COP, we also asked interviewees to identify the main individuals who acted as driving forces by strongly supporting measure development and implementation. The stakeholders most frequently mentioned were as follows: *Nursing setting*: scientific project coordinator ($n=6$), director of the nursing education programme

(2_set1) ($n=4$) and head of the school subject nursing (3_set1) ($n=4$). *Automotive setting*: occupational physician (5_set2) ($n=4$), scientific director ($n=4$) and director of the VE centre (1_set2) ($n=3$).

Facilitators and barriers

The category cooperative planning already contains some beneficial and impeding aspects of the COP process (e.g. main actors and non-participation of a political stakeholder). On top of that, we identified several specific facilitators and barriers that influenced planning and implementation.

In the automotive setting, the positive attitude of the instructors and directors was highlighted as a facilitator (Table 3). Frequently mentioned barriers were a low level of support within the company and organizational difficulties while integrating measures into the vocational training. In the nursing setting, the success of measures was highly dependent on the students' and teachers' attitudes. Moreover, the support from certain individuals was most frequently mentioned as a facilitator, whereas restricted resources and organizational challenges to the integration of measures for PA promotion into lessons or the curriculum were identified as barriers.

In both settings, the low relevance of the topic of PA promotion in relation to more dominant school issues or company goals was considered a barrier.

Because it [PA/PA promotion] is just a point on the agenda which is just a side note between producing cars and vocational training.

(5_set2)

DISCUSSION

The results of our study show that COP was successfully employed to enhance capacities for PA promotion in VE centres for nursing care and automotive mechatronics. In both settings, key individuals became increasingly aware of PA promotion and endorsed it as an important issue. In addition, we identified several challenging aspects of capacity development and sustainable measure implementation that need to be discussed. Overall, we found COP to be an appropriate approach because of its strength to take into account specific-context characteristics by effectively engaging organizational stakeholders and by creating a platform for knowledge exchange and interaction.

New capacities were mainly identified in the form of resources (e.g. provision of time and rooms) and opportunities (e.g. cooperation, support, awareness), which is

in line with the understanding of capacity building by other authors, such as Crisp *et al.* (2000) and the World Health Organization (Smith *et al.*, 2006). The comparatively small number of codings related to goals and obligations might be explained by the fact that these capacity dimensions may be more resistant to change and that it may take longer to change them in an institutional setting (e.g. by adapting mission statements, works agreements or curricula). However, we also noticed that the objective of promoting PA had to compete with more dominant school/company goals in the two organizations. This seems plausible given that their main task is not to improve apprentices' health behaviour but to train them for efficiently producing cars or working in the healthcare sector. Nevertheless, implicit health obligations seem to exist, as is suggested e.g. by the fact that it was the nursing teachers themselves who proposed the implementation of a trainer qualification and that the tutoring system was eventually implemented during working hours. Overall, however, the COP approach may be limited regarding its potential effects on goals and obligations, at least in the way we employed it. Future interventions might want to aim for a more systematic involvement of actors responsible for the strategic definition of goals and obligations at an early stage in the process. To achieve this, a thorough and more systematic analysis of the contextual situation (e.g. organizational readiness; Weiner, 2009) might be useful. However, it is in the nature of bottom-up approaches such as COP that not all management levels and responsible individuals in a complex setting can be included, as this would inadvertently result in top-down interventions.

Our results also show that the relationship between capacities and output was not unidirectional but rather non-linear or circular (Greenhalgh *et al.*, 2016). For example, the development of measures was possible thanks to newly built resources (e.g. providing time for the BUG lesson and the trainer qualification for teachers), but, in turn, the BUG lesson also supported the build-up of capacities (e.g. newly created cooperation with an external trainer). Likewise, opportunities were not only created by the COP process as such, but also through some of the measures developed, particularly those that allowed for the sustained implementation of PA promotion as a part of VE (e.g. trainer qualification of nursing teachers and funding opportunities for the tutoring system).

Relating our results to other studies is challenging as few interventions for PA promotion in the field of VE are reported in the literature. Two intervention studies from Taiwan (Lee *et al.*, 2012) and Finland (Hankonen

et al., 2017) used behavioural interventions to increase the PA levels of the individual participants. Whereas Lee *et al.* utilized a classical top-down approach, Hankonen *et al.* developed an intervention based on theoretical considerations, empirical evidence and stakeholder input. Both research groups successfully showed the feasibility and efficacy of such individual-level interventions but, unlike our study, did not address capacity building for PA promotion and its sustained implementation. A participatory approach similar to COP was used by Verloigne *et al.* (2017), who conducted sessions with a co-creation group to develop, implement and evaluate measures. However, the group only consisted of members of the target group and a researcher but no stakeholders from practice and policy. As several authors emphasize, the interaction among multiple components of a system and among the domains of practice, policy and research is highly important in health promotion (e.g. Gruen *et al.*, 2008; Jansen *et al.*, 2010), which is why we favour the approach used in PARC-AVE.

The literature also points out that the interaction and involvement of relevant stakeholders can pose a challenge, e.g. due to different working routines and perspectives (Jansen *et al.*, 2010). For this study, we have already outlined elsewhere that it was difficult to engage policymakers, especially one stakeholder in the nursing setting (Rütten *et al.*, 2019). Furthermore, we observed challenges regarding the active participation of the target group and the scheduling of meetings. These problems, along with other aforementioned barriers, may have also contributed to the fact that some developed measures were not implemented sustainably or ended up having an unclear implementation status. Our findings regarding barriers are in line with a review by Wiltsey Stirman *et al.* (2012), which lists characteristics such as resources, stakeholder support and integration as important influence factors for programme sustainability. However, the observed lack of knowledge about the implementation status might have also been a result of inadequate knowledge exchange among the involved stakeholders after the end of the COP process. Continuing regular meetings might be a suitable strategy to ensure necessary adjustments of measures and sustained knowledge exchange.

From a methodological point of view, we believe that it is important to further specify co-creation processes, such as COP, as recently described by Leask *et al.* (2019). In particular, it is necessary to provide more details on the methodological steps (e.g. roles, rules and processes) required for a successful process, as partially listed in the IMPALA Toolkit (IMPALAnet Project, 2017). Our description of the process (Table 1) might

contribute to this. The way in which COP was implemented in our study and our corresponding results may thus add to the further development of a methodological standard of COP in co-creation processes (Rütten and Gelius, 2014; Greenhalgh *et al.*, 2016).

An interesting area for further research could be the transfer of COP processes (i) to other VE settings to gather more information about how they work in other contexts and (ii) to a higher (political) level to further increase awareness of the issue of PA promotion in VE (scaling up) (e.g. Reis *et al.*, 2016). To achieve this, it seems valuable to take a closer look at some key influencing factors identified through our research: First, we want to highlight the main actors in both settings as important facilitators. In both settings, one particular stakeholder (head of the subject nursing, occupational physician) provided invaluable support throughout the entire process and became a ‘champion’ for PA promotion within his/her organization (O’Loughlin *et al.*, 1998; Greenhalgh *et al.*, 2016). For a successful scale-up, such key actors should be identified and actively involved in the COP process. Second, systematically assessing contextual factors, e.g. in the form of a checklist, might enable researchers to strengthen facilitators and overcome barriers even before an intervention starts. Other authors have attempted to assess organizational readiness prospectively to support the implementation of health programmes (Weiner *et al.*, 2008; Zhang *et al.*, 2015). As already aforementioned, this might be an effective way to gather information on existing structures and successfully guide health promoters through intervention preparation, development and implementation.

Strengths and limitations

For this study, we conducted qualitative interviews with stakeholders holding different roles within their respective organization. All interviewees were involved in the planning processes from the beginning so that the interviews potentially contained a wealth of information from diverse perspectives. We also accounted for the view of the target group by conducting a group interview with nursing students. We tried to conduct a similar interview with apprentices of automotive mechatronics, but, unfortunately, this was not possible due to scheduling problems.

Other limitations of this study pertain to the methodology. The interview guideline was discussed and rechecked within both the PARC-AVE research team and the Capital4Health consortium, but it was not pilot-tested. Transcripts were not returned to interviewees for

comments and feedback on the findings. Furthermore, data saturation was not discussed due to the limited number of potential interviewees.

Another issue is the evaluation of PA as an outcome variable. The focus of this study was to assess capacity building and the integration of PA promotion measures into VE structures. The question of whether these measures are actually able to affect the PA behaviour of the target group (e.g. increased PA levels) must be the objective of future studies. Therefore, appropriate measures should be employed to monitor PA levels over time, such as questionnaires or accelerometers.

Even though there are differences between nursing care and automotive mechatronics, we aggregated results from the two settings to highlight results from the field of VE as a whole. Further investigations should focus on a comparison of different contexts to highlight their similarities and differences.

Finally, whereas the study has a particular significance for VE in Germany, the relevance for other countries and educational systems may be limited. In particular, the COP approach has so far been mainly employed in Germany. However, it has been successfully used in a number of very different settings (e.g. kindergartens, schools and communities; Frahsa *et al.*, 2014; Rütten *et al.*, 2016, 2019), indicating that it might be flexible enough to also be adapted to other school or company contexts.

CONCLUSION

This study has described the cooperative development of PA promotion measures in two VE centres, the integration of these measures into existing VE structures and the associated build-up of capacities for health promotion. We have found that COP is an appropriate tool to foster capacity building for PA—especially in terms of new resources and opportunities—as it creates an effective platform for knowledge exchange among researchers, the target group and relevant stakeholders. In summary, organizational change for PA promotion was achieved, but some aspects remain challenging, notably the creation of new goals and obligations. The systematic involvement of actors responsible for organizational goals and obligations as well as a systematic context analysis at an early project stage might be helpful to achieve change regarding these and other ‘high-hanging fruits’.

An important conclusion for health-promotion practice is that it is necessary to find ways to overcome issues of non-sustainable measure implementation and different levels of knowledge of involved stakeholders concerning implementation status. Continued regular

meetings after the end of the initial COP process might be useful to overcome these problems as they allow stakeholders to make adjustments and to exchange information on a regular basis. Future projects may also want to consider relevant facilitators and barriers from the beginning to support the successful implementation of PA promotion interventions. In addition, it is vital to ensure the active involvement and participation of key actors in the planning process because they can play a key role as ‘champions’ and driving forces for PA promotion within their organizations.

From a scientific point of view, we believe that the results of this study provide valuable additions to the literature, especially in terms of capacity building, health promotion in the VE setting and the methodology of co-creation processes. But they may also serve as a point of departure for further research, particularly regarding how COP and the implemented measures affect the PA behaviour of the target group. Therefore, future research should investigate the effectiveness and long-term implementation of the measures described in this article, as well as the sustainability of the created capacities. In addition, ways of successfully scaling up COP interventions to other VE settings and to higher political levels should be explored. We will focus on these questions in the second funding phase of the PArC-AVE project (2018–2021).

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Ethical approval for research within PArC-AVE was granted by the Ethical Committee of the Friedrich-Alexander University Erlangen-Nuremberg.

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