A process evaluation of nurses' experiences with a nurse-led behaviour change intervention to enhance physical activity in patients at risk for cardiovascular disease.

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Internship at the Julius Center, UMC Utrecht, The Netherlands
Master's thesis, final version June 28th, 2017
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Reference style Vancouver
The Consolidated criteria for reporting qualitative research (COREQ)
Peer-reviewed journal, BMC family practice
Word count English abstract: 300
Word count Dutch abstract: 300
Word count body: 3588
Tables: 6

ABSTRACT

Background: Cardiovascular diseases(CVD) are mainly caused by modifiable risk factors such as physical activity(PA), increasing PA is an important behavioural target to reduce CVD risk. A widely accepted concept to change behaviour is self-management. Patients need to adopt self-management behaviours, and nurses need to change their behaviour in providing tailored information and support. A complex behaviour change intervention(BCI) was developed to change nurses' and patients' behaviour, the nurse-led Activate intervention. Nurses received an extensive training programme to change their behaviour in intervention delivery. To understand and explore its effectiveness, a process evaluation needed to be performed.

Objective: To evaluate the nurse-led Activate intervention by exploring primary care nurses' experiences with the training programme and with delivering the Activate intervention.

Method: A generic qualitative design, using semi-structured interviews for data collection and the six steps of Braun and Clarke's thematic analysis were performed.

Results: Fourteen nurses were interviewed. Nurses perceived the intervention as feasible for patients with CVD risk and low PA levels. The trial consultation context was perceived as both positive and negative. The learning process of nurses emerged from the data, which was influenced by the interaction between five themes: their learning mode, perceived self-confidence, motivation throughout the process and their ability and success in mastering and incorporating skills.

Conclusion: A pattern in the learning process of nurses was identified, influencing nurses' success in delivering the intervention according to protocol. Nurses' training, behaviour and experiences influence intervention delivery, underlining the importance of exploring nurses' experiences and providing an extensive training programme to change nurses' behaviour in delivering BCIs.

Implications of key findings: In future BCI development, factors influencing nurses' learning process should be taken into consideration. However, further research is needed to explore effective training components for nurses.

Keywords: cardiovascular diseases, physical activity, self-management, behaviour change, process evaluation

SAMENVATTING

Introductie: Hart- en vaatziekten(HVZ) worden voornamelijk veroorzaakt door beïnvloedbare risicofactoren, zoals lichamelijke inactiviteit. Verhoging van activiteit is een belangrijk doel om cardiovasculaire risico's te verminderen. Een veel geaccepteerde methode voor gedragsverandering is zelfmanagement. Patiënten moeten zelfmanagementgedrag gaan vertonen door ziekte en gedrag te managen en verpleegkundigen moeten informatie en ondersteuning op maat verstrekken. Een gedragsveranderingsinterventie, de Activate interventie, om gedrag van verpleegkundigen en patiënten te veranderen is ontwikkeld. Verpleegkundigen hebben een uitgebreid trainingsprogramma doorlopen om hun gedrag in interventie uitvoering te veranderen. Om de resultaten goed te kunnen interpreteren moet er een procesevaluatie worden uitgevoerd.

Doel: Evalueren van de Activate interventie door de ervaringen van verpleegkundigen met de training en uitvoering te exploreren.

Methode: Er is een generiek kwalitatief design gebruikt. Gegevens werden verzameld met behulp van semigestructureerde interviews en de analyse werd uitgevoerd volgens de zes thematische analyse stappen van Braun en Clarke.

Resultaten: Veertien verpleegkundigen zijn geïnterviewd. De verpleegkundigen hebben de interventie als haalbaar in de praktijk ervaren voor patiënten met een HVZ risico en inactiviteit. De context van de studieconsulten werd zowel als positief als negatief ervaren. Het leerproces met vijf sub-thema's werd zichtbaar in de data, het leerproces wordt beïnvloed door de interactie tussen de thema's; lerende houding, ervaren zelfvertrouwen, eigen maken, motivatie en behouden van vaardigheden.

Conclusie: Deze studie geeft inzicht in het leerproces van verpleegkundigen in het uitvoeren van een gedragsveranderingsinterventie volgens protocol. Verpleegkundigen hun training, gedrag en ervaringen beïnvloeden interventie uitvoering, dit bevestigt het belang van verpleegkundigen hun ervaringen exploreren en van een uitgebreid trainingsprogramma om verpleegkundigen hun uitvoering in gedragsveranderingsinterventies te veranderen.

Aanbevelingen: Bij toekomstige ontwikkeling van gedragsveranderingsinterventies moeten factoren die van invloed zijn op verpleegkundigen hun leerproces worden meegenomen. Echter verder onderzoek is nodig om effectieve trainingscomponenten voor verpleegkundigen te onderzoeken.

Trefwoorden: hart- en vaatziekten, lichamelijke activiteit, zelfmanagement, gedragsverandering, procesevaluatie

INTRODUCTION

Cardiovascular diseases (CVD) are a leading cause of mortality in Europe, with approximately 1.8 million deaths per year[1]. In the Netherlands, CVD is one of the leading chronic diseases, with a mortality of over 38,000 per year and a prevalence of over one million people[2]. Unhealthy behaviours (e.g. physical inactivity and unhealthy diet) are responsible for almost 80% of CVD prevalence[3], with physical inactivity being responsible for 20%–30% of the prevalence[3,4]. Physical inactivity is an important modifiable risk factor since patients who adjust their behaviour reduce their CVD risk[5]. Therefore, increasing physical activity (PA) is a behaviour change target in cardiovascular risk management (CVRM) to prevent CVD events[5,6]. However, only 33% of Dutch adults achieve the minimum amount of PA needed to improve or maintain physical fitness (i.e. 30 minutes of moderate PA for 5 days a week)[7].

A widely adopted concept to achieve behaviour change is self-management[8], defined as the ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes necessary to actively participate in chronic disease management[9]. Stimulating self-management could support patients in managing their disease and risk factors to prevent initial or subsequent cardiovascular events[5,10]. Patients at risk for CVD in the Netherlands often receive self-management support to increase healthy behaviours, such as PA, by a primary care nurse.

The effects of the support depend on patients' abilities to adopt self-management behaviours and on nurses' skills to provide support[11]. Studies have shown heterogeneous results about the efficacy of self-management interventions due to a large heterogeneity in patient characteristics, trial designs, intervention components and outcome measures[12]. Nurses' current support is often fragmented[13] and not tailored to patients' needs[14], which means they need to change their behaviour to change patients' behaviour[15]. Both adequately trained nurses and patient-centred interventions are important to study the effectiveness of these interventions[16]. Therefore, nurses need to tailor information about behaviour change and support their patients[14,15]. However, nurses do not always improve or adopt skills after training sessions, possibly influencing intervention results[14].

A promising intervention development framework which could enhance behaviour change in both nurses and patients is the behaviour change wheel (BCW)[17]. This framework consists of three layers: sources of behaviour, including capability, opportunity and motivation (COM-B), as well as intervention functions and policy categories[17]. The COM-B is used for behavioural analyses to assess what hinders and facilitates nurses' and patients' behaviour change[17]. The intervention functions layer addresses the aspects that hinder behaviour change, leading to the selection of behaviour change techniques (BCTs)[17]. BCTs are specific

theory-linked techniques included as active components in a behaviour change intervention (BCI) and are used to describe intervention content (e.g. specifying a behavioural goal, increasing skills and social support)[17,18].

The Activate trial was designed using the BCW to change patients' behaviour but also to train and equip nurses with the skills to change their behaviour in delivering interventions[15]. The Activate trial was a two-armed clustered randomised controlled trial, comparing the nurse-led Activate intervention with care as usual according to CVRM[19] in 31 general practices throughout the Netherlands[15]. The BCW was applied twice: first to assess patients' needs to change their level of PA and second to assess nurses' behaviour change needs to deliver the Activate intervention adequately[15]. To change patients' self-management behaviour, 17 BCTs were selected and incorporated in four nurse-led consultations to enhance PA of patients at risk for CVD in primary care[15]. The nurses applied these 17 BCTs during the consultations, but to do so, nurses needed to change their behaviour in providing tailored information and support. Therefore, 21 BCTs to change nurses' behaviour were selected and incorporated in a training programme (one-day training, coaching and resources—see Appendix 1).

To accurately interpret and understand the effectiveness of the Activate intervention, a process evaluation needed to be performed to explore nurses' training and intervention delivery experiences. Process evaluations of complex interventions can help researchers to understand the intervention's mechanism of change and to explain the main study results[20,21], as underlined by the Medical Research Council[22] (MRC) framework and the CONSORT statements[23] for reporting complex, non-pharmacological interventions.

OBJECTIVE

Evaluate the nurse-led Activate intervention by exploring primary care nurses' experiences with the training programme and with delivering the Activate intervention.

METHODS

Design

A generic qualitative study was performed using thematic analysis (TA) of Braun and Clarke[24] to provide an in-depth understanding of nurses' experiences with the training programme and intervention delivery.

Sample and recruitment

In the main study, 20 primary care nurses were included to deliver the intervention after cluster randomisation. Primary care nurses eligible for this study participated in the training

and delivered the intervention to at least three patients in order to have sufficient experience with delivering the intervention. Four nurses did not meet the inclusion criteria. The researcher (HW) informed 16 nurses by email about the process analysis. They were invited for a semi-structured interview as soon as they completed the intervention. In total, 14 nurses were willing to participate and were contacted by email by the researcher (YK) to schedule an appointment.

Taking into consideration primary care nurses' age, level of education and work experience in CVRM, the researchers obtained a purposeful sample with maximum variation to explore different perspectives of nurses.

Data collection

Semi-structured, face-to-face interviews were performed. The topic list, presented in Table 1, was developed and reviewed by the research group on feasibility (i.e. the practicality of the topic list) and completeness. Completeness, as in all topics about the training programme and intervention delivery were addressed, such as experiences with incorporated BCTs in the training and the delivered BCTs during consultations. All BCTs incorporated in the intervention are presented in Table 2. The topic list was refined during the process to explore and understand all topics better by probing nurses with further questions and discussing detailed experiences.

A nursing science student (YK) conducted 11 interviews, and a medical student conducted three interviews (PS). All interviews were audiotaped. The interviewers were unknown to the nurses prior to the interview, possibly enabling nurses to express their honest experiences and opinions without inhibitions. Each nurse was interviewed once; interviews were performed at the general practice or nurses' homes based on nurses' preferences. Interview durations ranged from 35 to 62 minutes, with a mean of 48. The interview techniques of the first three interviews were evaluated by an experienced researcher (HW).

Interviews were performed until data saturation was achieved. If information solely confirmed the framework, then the point of data saturation was considered to have been reached[25].

Data analysis

All interviews were transcribed verbatim (YK). Transcripts were discussed after every three interviews (HW, SV, YK). The researchers performed TA according to six steps as presented in Table 3; TA is a flexible and methodologically sound approach to identify and report patterns in the data[24]. This method allowed the researchers to reflect on the data,

which, in turn, enabled them to articulate nurses' experiences. NVivo 11 software (QSR International, Victoria, Australia) supported the coding process[26].

Trustworthiness

Credibility[27] of the analysis process was enhanced by researcher triangulation and peer review. A qualitative research expert (SV) was involved throughout the data collection and analysis, ensuring the accuracy and enhancing data dependability[27]. Biweekly meetings to discuss data collection and analysis decisions enhanced methodological quality (HW, SV, YK). Furthermore, an audit trail ensured the study's confirmability[27], and the 15-point checklist by Braun and Clarke[24] ensures each TA step was performed according to methodological quality criteria. Field notes and memo writing supported the analysis and enhanced study reliability[28]. The consolidated criteria for reporting qualitative research (COREQ) were used to report the results[29].

Ethics

This study is nested within the Activate study, which was approved by the Medical Ethics Research Committee of the University Medical Centre Utrecht with protocol ID NL54286.041.15[15]. Written informed consent was obtained from all nurses prior to the semi-structured interviews.

RESULTS

Between October 2016 and March 2017, 14 nurses were interviewed; all nurses were female and between 24 and 63 years of age (mean 48.9); mean work experience as a primary care nurse in the field of CVRM was 7.2 years (SD 4.2). All baseline characteristics are presented in Table 4.

At first, the general experiences with the intervention as perceived by the nurses are described, followed by the experiences with the trial consultation context and finally the main category, the learning process, which is sub-divided into five themes.

Nurses' experiences with the intervention

In general, all nurses said the intervention was feasible for the population at risk for CVD with low PA levels as they experienced patients' positive results with increasing PA. They perceived study consultation structure as helpful, although this same structure resulted in more time-consuming consultations. Essentially, the study's consultations were more tailored to patients' needs and circumstances, and they used BCTs, such as goal setting and action

planning. The extra time was perceived as acceptable if the general practices provided nurses with extra time in their schedules.

Some nurses experienced difficulties with patient recruitment because some patients were not motivated to participate. Therefore, some nurses expressed they wanted to select patients based on motivation instead of trial inclusion/exclusion criteria.

Nurses said they discussed barriers and received satisfactory and helpful answers from the research team within 24 hours.

Trial consultation context

Nurses perceived the difference in context between the trial consultations and the standard consultations as both positive and negative. Almost all nurses felt that already knowing the patient was helpful since they knew the patients' background and needs. Additionally, only discussing PA was perceived as positive and a strength of the intervention, it allowed nurses to provide extra information and attention in order to increase PA.

Box 1.

N6:'I thought because you really pay a lot of attention to it now, people are more conscious of it, but also because they have to come back. Then you're talking about physical activity again...so the strength of it is partially in the repetition of it.'

However, some nurses said knowing a patient beforehand was a barrier for delivering the consultations adequately since the patients had different expectations of the consultations.

Box 2.

N9:'People also visit me for their blood pressure...and then I notice that it's difficult for them to exclusively discuss their physical activity.'

Moreover, one nurse believed that knowing the patient and delivering the intervention was possibly harmful for the relationship with the patient, as she felt that asking further questions for clarification could annoy the patient.

Box 3.

N8:'...further questioning is sometimes also a bit bothersome to someone...with the risk that someone will find me annoying....When I have a trial consultation, there is already an existing relationship between the patient and me...Now that I think about it, it's coming from me, the anxiety for that, that the relationship gets damaged.'

The learning process

During the analysis, five themes emerged related to the nurses' learning process, which was influenced by the interaction between these themes. Therefore, the learning process is presented as a main category with five sub-themes: learning mode, mastering skills, perceived self-confidence, being motivated and incorporating skills.

Results with the training programme and intervention delivery are integrated and described in the five themes.

Learning mode

Data showed that nurses' mindsets influenced their ability and success in terms of mastering and incorporating skills, as well as their motivation to learn and deliver the intervention. The data indicated a division into fixed and growth mindsets, which influenced the personal development of nurses throughout the intervention process.

Data showed that nurses with fixed mindsets were merely influenced by extrinsic factors, such as unmotivated patients and inclusion difficulties. Nurses with this mindset expressed that they did not use or barely used the resources, and some nurses said they did not use the intervention structure during the consultations for this study, because they perceived the resources as a barrier in their communication with a patient.

Data showed that nurses with growth mindsets were merely influenced by intrinsic factors. Nurses expressed that they set personal learning goals, and they engaged in the training and sought feedback. Moreover, they said they reflected on their experiences and used resources to help deliver the consultations. Nurses with this mindset reported a higher rate of mastering skills, and the data showed that they were more likely to deliver the intervention according to protocol. Additionally, they perceived patients being more difficult to motivate and less likely to succeed as a challenge, adding that this provided an opportunity to learn and further improve their skills to motivate patients.

Box 4.

N14:'If it doesn't work, it's also a challenge to motivate someone; if it doesn't work out, you do have a challenge to get those people to change.'

Mastering skills

Nurses expressed that the training programme positively influenced the process of mastering skills; they could practise and repeat skills to prevent a relapse into old habits, and they said the resources aided them in preparing the consultations. All nurses found that the role-play activities during the one-day training, in particular, helped them to acquire skills because of the small-scale and safe learning environment. They immediately received feedback on their performance, allowing them to practise the instructions received previously. They also indicated that practising was pivotal in creating routine and mastering consultation techniques.

Box 5.

N12:"...If you've learned something, you want to apply it five or 10 times...same as when you learn to cycle, and you watch a video, and you practise it, and then you don't or hardly do it anymore. Well, it's a bit like that feeling.'

Nurses said using resources during consultations, preparing the consultations by reading and practising with the workbook, and watching the instruction videos helped them to optimise their skills. Receiving two individual coaching sessions on audio-taped consultations by a health psychologist (i.e. credible source) was perceived as a positive aspect of the training programme, as it helped nurses to perform consultations according to the protocol.

According to the nurses, mastering skills was also influenced by extraneous factors hindering them in practising often and creating a routine. These factors included a lack of time due to the absence of the primary care nurse, job strain or inclusion difficulties. Other perceived barriers involved not completely remembering all the information received if there was a long time between the training session and the actual delivery of the intervention, as well as the difficulty of the accelerometer and the consultations as perceived by the nurses. Nurses' experiences with training programme components are displayed in Table 5.

Perceived self-confidence

All nurses perceived their self-confidence to deliver the intervention as high after the training session. Positive influences as perceived by the nurses were having enough knowledge after the training, having the resources, such as the workbook, and practising and mastering skills with the instruction videos. Nurses also explained that preparing the consultations using resources boosted their self-confidence.

Box 6.

N10:"...before I got someone, I looked in the workbook for that consultation, to, well...This has to be addressed, and I often just left the workbook open.'

However, nurses also perceived delivering the intervention as being more difficult than previously expected.

Box 7.

N13:"I had confidence in it. But I sometimes found it difficult, as I said at the start. Perhaps I was too optimistic at the start like, "Oh, I can do it"; halfway, I thought, "Well, that's quite difficult.'

Furthermore, nurses expressed the intention to deliver the intervention as expected per protocol. At first, this was perceived as difficult, but after creating a routine, their self-confidence increased.

Box 8.

N2:"…maintaining the correct order and you, you think: Yes, now it's really going to start. You did notice when you've had a few, once you were doing it, you did get more and more confident.'

Some nurses said they felt uncomfortable when asking patients for motivation, intentions and confidence grades because the questions were perceived as too similar and difficult for patients, influencing nurses' self-confidence. Nurses also noted that patients' motivation influenced their own motivation and self-confidence.

Box 9.

N13:"I noticed that I was more excited when people were also participating enthusiastically..."

Being motivated

Nurses stated that their motivation was high at the start of the intervention. It was often linked with their reason for participation; nurses said they believed in the importance and effectiveness of PA on CVD risk. However, they expressed the need for training and resources to be able to change patients' behaviour. Nurses said seeing the effect of the intervention on patients' behaviour motivated them to deliver the intervention.

Box 10.

N13:"...I found it very nice to see. It makes you feel excited to keep going, seeing that it also has an effect on people and that people feel fitter. Ultimately, you do it to help people, so it provided extra motivation.'

Nurses also felt they could improve care by delivering a higher quality of consultations after the training programme.

Box 11.

N6:"The feeling that you can do your job better, that you can make a difference to people, that you have more to offer them..."

Most nurses said their enthusiasm to learn and deliver the intervention and seeing the patients' progress increased their motivation. Also, as well as influencing their self-confidence, seeing the progress and successes of their patients influenced nurses' motivation to deliver the intervention.

Incorporating skills

All nurses said their standard consultations changed during and after intervention participation. Most nurses said that PA was not discussed in such a structured and thorough manner beforehand. Nurses said they asked more follow-up questions, summarised more during consultations and asked for grades to get insight into patients' motivation. They

expressed that they became more critical towards patients' answers and saw the possibilities instead of barriers for patients. All nurses said they let patients answer, set goals and plan actions, instead of coming up with a solution for the patients.

Box 12.

N8:'I became more aware of the fact that it's important for someone to come up with their own solution, even though I am staggering with enthusiasm...if I take a step back more can arise from oneself and that is very powerful in this work.'

Nurses perceived that the training programme enabled them to reflect on their consultation styles in order to improve their skills. They added that most incorporated skills were the skills on which they received feedback during the coaching because they spent more time on mastering these skills. Their experiences with the most commonly mentioned incorporated skills are presented in Table 6. Moreover, most nurses said the skills are suitable and helpful during other lifestyle-related consultations.

Box 13.

N13:'Well, of course, now it's very focussed on just physical activity, but you can use it for other things as well. Modify nutrition, for example, for weight loss. Quit smoking.'

DISCUSSION

Overall, the nurses perceived the Activate intervention as positive; they perceived patients' successes in increasing PA motivating, they found the intervention structure helpful and the intervention feasible for the population to improve PA and other healthy behaviours (i.e. healthy diet). All nurses changed their behaviour after trial participation, as they reported they used the skills learned during later standard consultations, such as setting and reviewing goals, problem solving and action planning. In particular, the training programme, accurately constructed using the BCW, enhanced nurses' behaviour change, but also, they appreciated using resources, repeating information and practising applying BCTs during consultations. The nurses felt properly equipped to deliver the intervention adequately after the training; it allowed nurses to practise, master and incorporate skills, increasing their self-confidence.

However, nurses' behaviour change and their learning process were highly influenced by their mindsets, which influenced their motivation and ability to learn skills. Heslin and Keating[30] explained that mindsets are people's beliefs and personalities controlling their behaviour, performance and abilities, which concurs with this study's findings. Nurses with different mindsets encountered different barriers; for instance, inclusion difficulties had more influence on nurses with fixed mindsets. Considering these differences early, continuing

involvement and coaching of a research team could aid these nurses, possibly increasing protocol adherence, as also suggested in a previous process evaluation[31].

Consistent with this study, Beighton et al[31] argued that in a PA intervention with an extensive training using BCT's, support, feedback and motivation, were seen as enablers for intervention delivery. Our findings expand upon this study by identifying experiences with training and intervention components and how these influence nurses' learning process. This suggests that nurses' training to deliver a BCI in a trial or routine care should be comprehensive, interactive and delivered by a credible source. Many process evaluations exclusively study patients' (non-) participation[32] or intervention barriers and facilitators[33,34]. These studies have highlighted a lack of patient-physician communication as a barrier[34], whereas support and monitoring by nurses were considered to be facilitators[33], underlining the importance of improving communication between nurses and patients, as evaluated in this study. Another BCI to increase PA in primary care used a self-monitoring tool and self-management counselling, which led to significant increases in PA[35]. Weegen et al[35] provided a small training programme for nurses, though it did not present the effects of nurses' self-management counselling on patients' behaviour. Moreover, this study included patients with higher PA levels, above 30 minutes of moderate PA, and with different chronic diseases(COPD and diabetes)[35]. This suggests that self-monitoring tools could be of added value for BCIs. However, counselling by nurses was stated to be essential to achieve and maintain behaviour change[35], and adequately delivering a BCI requires tailored and extensive training for primary care nurses throughout the process[31].

Nurses' experiences with interventions are less often studied compared to patients' experiences and, if studied, nurses' skills or protocol adherence are quantified[20]. This study provides a more in-depth view on nurses' experiences by exploring the reasons for nurses' skills or protocol adherence, which is a strength of this study. Another important strength is researcher triangulation; the analysis was performed by two researchers independently of each other and supported by a qualitative research expert. This, in addition to memo writing, field notes and an audit trail, enhanced data-analysis reliability and trustworthiness. Moreover, the interviewer was unknown to the nurses prior to the interviews, possibly enhancing the data's dependability as it might have allowed nurses to express honest experiences and opinions without inhibitions. Although the results of this study were based on fourteen nurses, data saturation was achieved, and a maximum variation sample increased the data's diversity and likelihood of a representative sample.

A limitation of this study was not being able to interview all nurses who participated in the trial; those nurses may have expressed different views, possibly affecting the results. However, 14 of 16 eligible nurses participated, and data saturation was achieved, suggesting

that this did not limit the study's results. Another limitation is the possibility of recall bias, as some interviews were not scheduled immediately after nurses completed the intervention possibly influencing information accuracy. Therefore, researchers used prompts, cues and further questioning during the interviews to retrieve nurses' memory of the training programme and intervention delivery.

More research is needed to explore if an accurately constructed training programme using the BCW, different training programmes or differences in training components would result in a higher protocol adherence rate in nurses with fixed mindsets. Moreover, nurses interviewed for this study with growth mindsets were more likely to master and incorporate skills and be protocol adherent, suggesting that, in the development of a training programme, differences in mindset should be taken into account. Components such as individual coaching, practical resources and one-day training with role-play, feedback, information and instruction provided by a credible source were found helpful because they aided nurses in their learning and increased self-confidence and motivation. Therefore, using these components in the development of future training programmes is recommended. Additionally, nurses' perspectives on BCIs and/or training programmes have rarely been studied. Therefore, future research on BCIs should include a process evaluation of nurses' experiences.

This study explored nurses' experiences with the training programme and with delivering the Activate intervention. A pattern in the learning process of nurses was identified and confirmed the importance of exploring nurses' experiences with BCIs, because nurses' training, behaviour and experiences influence nurses' success in adequately delivering the intervention. This study also confirmed the importance of understanding how nurses deliver a BCI, as well as the importance of an accurately constructed training programme to prepare nurses to adequately deliver a BCI. This could help researchers to understand trial effects and enable intervention reproduction or adaptation for further research and implementation.

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TABLES

Table 1. Topic list

Training programme	Delivering the Activate intervention
The effectiveness of the training day to deliver the intervention;	The barriers and facilitators of applying BCTs during the consultations;
The usefulness of the coaching to help nurses deliver the intervention;	Self-confidence of the nurses in applying BCTs during the consultations;
The applicability of the training materials;	Applicability of the materials used during the intervention;
Their experiences with the methodological process of the main trial study.	Degree of difficulty of the inclusion process and applying BCTs;
	Communication with the research team;
	Motivation of the nurses to deliver the intervention and participate in a trial;
	Motivation of the patients as perceived by the nurses;
	Perceived effectiveness of the intervention;
	Evaluation of the acceptability of the intervention for use within routine primary care.

Table 2: All BCTs incorporated in the training programme and nurse-led consultations[15]

The 17 selected BCTs to change patients' behaviour in 4 nurse-led consultations		The 21 selected BCTs to change nurses' behaviour in the training programme	
1,2,3,4.	Goal setting (behaviour)	1,2,4.	Information about health consequences
1,2,3,4.	Problem solving (Includes barrier identification and relapse prevention)	1,2,4.	Information about social and environmental consequences
1.	Goal setting (outcome)	2,4.	Prompts/cues
2,3,4.	Action planning	2,3.	Feedback on the behaviour
2,3,4.	Review behavioural goal(s)	2,3.	Information about other's approval
2,3,4.	Commitment	1,2,3,4.	Credible source
1,2,3,4.	Feedback on behaviour	2,3.	Focus on past success
1,2,3,4.	Self-monitoring of behaviour	2,3.	Verbal persuasion about capability
2,3,4.	Social support (unspecified)	2,3.	Reward
2,3,4.	Social support (practical)	2,3.	Monitoring of behaviour by others without feedback
1,2.	Information about health consequences	2,3.	Monitoring outcome of behaviour by others without feedback
1,2,3,4.	Prompt/ cues	1,2,3,4.	Instruction on how to perform the behaviour
3,4.	Habit formation	2,3,4.	Demonstration of the behaviour
2,3,4.	Graded tasks	2,3,4.	Behavioural practice/rehearsal
1,2,3,4.	Restructuring the physical environment	2,3,4.	Habit formation
1,2,3,4.	Restructuring the social environment	2,3,4.	Adding objects to the environment
2,3,4.	Focus on past success	2,3,4.	Restructuring the physical environment
		2,3.	Social support (unspecified)
		2,3.	Social support (practical)
		2,3,4.	Problem-solving
		2,3.	Self-monitoring of behaviour

BCT's to change patients' behaviour are divided over 4 consultations, number 1, 2, 3 and 4
BCTs to change nurses' behaviour are divided over the training programme, 1: preparation, 2: 1-day training, 3: coaching sessions and 4: available resources (instruction videos, workbook and checklist)

Table 3. Description of data analysis according to the six steps of thematic analysis

Phase	Description of the process
1. Familiarizing with the data	Interviews were transcribed (YK), the transcripts were read and re-read and initial ideas for topics were discussed in the research team. (HW, YK, SV)
2. Generating initial codes	All transcripts were coded by two researchers independently of each other (YK, HW). Interesting features of the data were coded in a systematic fashion across the entire data set, collating data relevant to each code. The codes were presented and discussed in the research team. (HW, YK, SV)
3. Searching for themes	Codes were collated into potential themes, gathering all data relevant to each potential theme. A preliminary description of potential themes and subthemes was made and discussed. (HW, YK, SV)
4. Reviewing themes	The preliminary themes were checked if they were consistent with the original data (YK). Inconsistencies were discussed and the themes were further explored. (HW, YK, SV) The main and subthemes were revised accordingly and further described (YK) and reviewed (HW,SV).
5. Defining and naming themes	The specifics of each theme were discussed and names and definitions of themes were refined. (HW, YK, SV)
6. Producing the report	A first draft of the results was written (YK) and reviewed (HW, SV). The quotes were selected to clarify the presented data, the report was further discussed (HW, YK, SV) and adjusted (YK). The report was critically assessed by the research team and further adjusted to adequately present the themes with verbatim quotes. (HW, YK, SV)

Table 4. Nurses' baseline characteristics

ID	Age	Educational background	Work experience	Vocational training
N 1	55	Healthcare assistant	12	None
N 2	41	Healthcare assistant	14	MI and Socratic method
N 3	63	Healthcare assistant	2	None
N 4	54	Registered nurse	5	MI
N 5	52	Registered nurse	5	MI
N 6	47	Registered nurse	9	None
N 7	39	Bachelor of science in nursing	9	None
N 8	36	Bachelor of science in nursing	2	MI
N 9	58	Healthcare assistant	2	MI
N 10	55	Registered nurse	11	MI
N 11	56	Healthcare assistant	6	MI
N 12	50	Bachelor of science in nursing	13	MI and Socratic method
N 13	24	Bachelor of science in nursing	3	MI
N 14	55	Registered nurse	8	MI and self-management

MI= Motivational interviewing, Age is presented in years
Work experience is presented in years of experience as a primary care nurse in the field of CVRM

Table 5. Nurses' experiences with components of the training programme

Components	+/-	Experiences of the nurses
Information videos	+	N13: "Helpful ...A lot of information was already known ... But to refresh it was good. Yes."
One-day training information	+	N12: "... to refresh the information. Just mentioning the framework on how to structure the conversation, the purpose of the conversation. What does someone want, what are you, how do you ask something and then applying it yourself."
Materials explanation during the one-day training	+	N11: "... Self-study takes far too much time. So I found the explanation very important. "
	-	N2: "You know, during a training, the explanations about the paper activity log and accelerometer. You already know it."
	-	N10: "…the explanation was a bit too short for me, about the accelerometer. I was struggling with it at the start."
Role-play during the one-day training	+	N13: "…practicing in role-plays, because you receive tips on how to handle certain things and also example sentences you can use."
	+	N8: "Using the text literally and then using it in your own words as much as possible.", "once I've already said it out loud, it's easier to use it again. If I just read it, the script, the questions, then it's less powerful compared to when I've already done it before
	+	N10: "It happened in small groups, so you didn't have to practice it in front of a group. So it was a safe and secure environment, so that was nice."
	+	N11: "…first of all the small-scale, practicing with two… At least for me it's an obstacle to practice a role-play in front of a group… and having someone to observe… who provided feedback on it. So it was a very safe setting in which, without being judged or anything, you received objective feedback."
Coaching sessions and recording consultations for coaching	+	N13: "She does give tough feedback. Though, very good. You also notice that she really took a good look at it. Also rightly so.", "You really notice in her feedback that she carefully listened to everything and she also came with examples from the recordings"
	-	N4: "yes, I especially don't like that, I did ask a patient but I was, I didn't really insist on it, that it was important. You had to record it, you know.. I just don't really like that and luckily those people didn't either."
Instruction videos	+	N10:"...the videos too. The fact that you see, in those videos they practiced with someone who did, where the goal was achieved and with someone who didn't. Well, and how you deal with those differences and how you handle it and you can practice it with each other later."
	+	N8: "I liked watching those videos on the training day... I found those videos to be of added value. Just to see it in action, the script. "
	+	N13: "Well, in particular, you really get specific examples. So if you get stuck with further questioning ... then you'll hear a different sentence in that video, which you can use for that."
	-	N12: "Well, I think what's in those videos, is also in the workbook, maybe. I do not have a uh. I don't recall that there's different information available in it."
Checklist	+	N13: "... you have a checklist with" have you already discussed this? "... I just kept my workbook with me, then you have very specifically what you need to ask."
Workbook	+	N12: "... you could actually ask it literally, that sentence, and then I think that's useful because otherwise I'll forget the questions or I'll fill in too much.", "No, it frames it a bit more, sometimes it makes it a bit more compact and focused. That you stick to the subject better. "
	+	N2: "... it was nice. Also when those people said, what do you mean or uh you could just read that part out loud, you know. "
	+	N13: "Well, I found it very convenient, because without it I couldn't have done it."
	-	N1: "But, if you don't talk like that. Like, I do make my own sentence, but yes. Of course it helps. Though, you don't literally say it like that. Because then… the conversation is less fluent. Then you are reading out loud and the patient has to answer… you don't do that. Because that's.. uh… I think that's… strange."
Accelerometer for patients as perceived by nurses	+	N11: "... it makes it very clear to them.", "They are very excited about such a meter and uh they just want to provide results."
	+	N13: "very nice. Yes. This accelerometer simply provides insight, it just makes it very specific how much you have moved. "
	-	N8: "I think that the accelerometer was quite complicated ... and at the same time keeping track of it can also be a burden."
Activity log for patients as perceived by nurses	+	N8: "I think it's good to do it systematically. In theory, I think such a motivator of the accelerometer and documenting it; You cannot fool yourself, and I think that's very powerful. "
	+	N12: "... it's very useful for the long term. If you look back from, what was your goal again. How many days have you achieved your goal. "
	-	N6: "I also noticed that the paper activity log for people wasn't very clear."

+ are positive experiences, – are negative experiences

Table 6. Nurses' experiences with using their learned skills during consultations

Behaviour Change Techniques	Experiences of the nurses
Goal setting (behaviour)	N13: "You are very aware of the goals of the patients, what they want. This allows patients to think about what they want… so just making them more aware of how much they're active. Yes. So if you make it very specific, "run five days a week for half an hour", patients also know "ok, this is my goal and I'm going to get started". Then you can also say, "I did or did not do it". "
Problem solving (Includes barrier identification and relapse prevention)	N14: "You can give it back to someone, they have to do it themselves. Well, trying to find a solution to, how can you achieve to be more active, what do you need. Some people just aren't creative enough to find a solution. That makes it more difficult that you're not solving it for them. " Interviewer: "So it really has to come from the patient and not the nurse." N: "Yes, of course, it works best if they come up with something themselves. "
Goal setting (outcome)	N4: I: "Did you set specific goals with the patients?" N: "Yes, but I couldn't set them, the patients had to... they set very high goals… but they also did it, my patients, but I, the first consultation their goal was 30 minutes and I was like, wait we do need something to improve/build. "
Action planning	N9: "Yes, I tried. But it was very difficult for people to put it into words. That was often a problem ... they had so few health skills, that was quite difficult. I can tell them how to put it into words, but yes, I wasn't really supposed to do that either I think."
Review behavioural goal(s)	N2: "Yes, exactly, and we did that by means of the activity log... So nice you know to, to see what they are doing you know, but also the explanation you get. Yes. Yeah, really had people who said... they saw in the evening, oh well, oh my activity, no I'm not going to make it today. Well there they went, another round by bike. "
Feedback on behaviour	N11: "The feedback. Well, no, I didn't perceive that as very difficult because that's just a factual display of what is being presented and what the patient. And then you can ask what the patient thinks about it himself. And yes, I don't really have a judgment about it, uh. "
Self-monitoring of behaviour	N13: "The accelerometer just provides insight, which just makes it very specific how much you have moved. Actually you normally don't really think about it that much. Then you just see it really specifically in minutes, like "I've walked this much, I've actually moderately moved or sported this much". And the activity log; I also noticed with the patient that they really liked filling it in, not too much effort or anything or too much work. No, it was always filled in properly. Yes, it also encouraged them to continue. Yes, yes."

Appendix 1: Activate intervention

Nurses' training programme

All nurses who delivered the Activate intervention received a training programme consisting of a one-day training, coaching sessions and resources. The one-day training in a small group (three nurses) was led by a health psychologist and aimed to increase the nurses' self-efficacy, outcome expectancy, capability, motivation, and opportunity. The coaching sessions were reinforcements after the training, nurses received feedback on two audiotaped consultations by the health psychologist to optimize the trained skills in applying the BCTs during the consultations. The resources were instruction videos of the four consultations on how to apply the BCTs, a workbook with example sentences and a checklist.

Nurse-led consultations

Nurses delivered four consultations to enhance physical activity. Although nurses systematically applied BCTs, the content of the intervention was adapted to the individual patient and his unique circumstances, by goal setting, action planning, feedback, etc. Nurses discussed the patients' CVD risk profile, the consequences of a sedentary and active lifestyle and self-assessment of their activity level to raise the awareness to improve the level of physical activity of the patient. Together the patient and nurse formulated an overall outcome goal and an exercise goal. Patients self-monitored their behaviour by using an accelerometer and a paper activity log, which helped nurses to provide feedback on the reached level of goal attainment. Nurses supported patients in finding ways to use facilitators to attain the physical activity goal and to identify possible barriers to goal attainment. Moreover, nurses discussed how to prevent relapse into an inactive lifestyle (old habits) by discussing the barriers for relapse and how to build new habits to keep the active lifestyle.