Human support in eHealth lifestyle interventions

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LIFESTYLE SUPPORT PREFERENCES OF PATIENTS WITH CARDIOVASCULAR DISEASES: WHAT LIFESTYLE SUPPORT MIGHT WORK BEST FOR WHOM?

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ABSTRACT

Background: Lifestyle support is essential in preventing and treating cardiovascular diseases (CVD), and eHealth may be an easy and affordable solution to provide this support. However, CVD patients vary in their ability and interest to use eHealth. This study investigates demographic characteristics determining CVD patients' online and offline lifestyle support preferences.

Methods: We used a cross-sectional study design. 659 CVD patients (Harteraad panel) completed our questionnaire. We assessed demographic characteristics and preferred lifestyle support type (coach, eHealth, family/friends, self-supportive).

Results: Respondents mostly preferred being self-supportive (n=179, 27.2%), and a coach in a group or individually (n=145, 22.0%; n=139, 21.1%). An app/internet to work independently (n=89, 13.5%) or being in touch with other CVD patients (n=44, 6.7%) was least preferred. Men were more likely to prefer being supported by family/friends (p=.016) or self-supportive (p<.001), while women preferred a coach individually or via an app/internet (p<.001). Older patients mostly preferred self-support (p=.001). Patients with low social support were more likely to prefer being coached individually (p<.001), but not support from family/friends (p=.002).

Conclusion: Men and older patients are more interested in being self-supportive, and patients with lower levels of social support could need extra support outside their social network. eHealth could provide a solution, but attention should be paid to spike interest for digital interventions among certain groups.

Keywords: cardiovascular diseases; cardiac care; patient perspectives; lifestyle; eHealth; digital health; self-management

INTRODUCTION

Cardiovascular diseases (CVD) are a major health problem. Within the Netherlands, one out of ten people suffer from CVD, and a quarter of all deaths in 2019 were caused by CVD (de Boer et al., 2020b). Similar patterns can be observed globally, as 32% of worldwide deaths were CVD-related (WHO, 2021). However, studies show that new CVD incidents could partly be prevented by a good diet, sufficient physical activity, sleep, and not smoking (Piepoli et al., 2016; Wilkins et al., 2017). The positive effects of engaging in a healthy lifestyle are comparable to medication intake (Iestra et al., 2005), but many CVD patients have an unhealthy lifestyle (Kotseva et al., 2019). Therefore, lifestyle interventions are recommended by national and international guidelines (Hartstichting, 2011; Piepoli et al., 2016). Within the Dutch context, all CVD patients are referred by their cardiologist to follow cardiac rehabilitation directly after hospital discharge (Hartstichting, 2011). Cardiac rehabilitation consists of physical goals (e.g. improving exercise capacity), psychological goals (e.g. improving emotional wellbeing), social goals (e.g. going back to work), and improving risk behaviours (e.g. physical activity, nutrition, smoking) (Hartstichting, 2011).

Despite efforts to improve their lifestyle during cardiac rehabilitation, many patients experience difficulties to maintain a healthy lifestyle once they return to their everyday life (Janssen et al., 2013; Ter Hoeve et al., 2015). But even though long-term lifestyle support is important, there are barriers in the healthcare domain that may hinder patients from getting this support, such as a lack of time, financial resources, or experience with lifestyle support among healthcare professionals (e.g. Brotons et al., 2005; Jallinoja et al., 2007; Janskink et al., 2010). As a solution, patients are increasingly frequently offered tele-rehabilitation, in which lifestyle support can be offered with the use of eHealth. eHealth can be defined as interactive digital tools used to provide either remote support (e.g. by a healthcare professional) or automated support (e.g. automatically generated feedback) (Barak et al., 2009). Furthermore, eHealth can provide patients with control and a sense of autonomy during the lifestyle intervention (e.g. by providing insight into objective health markers or setting their own goals), and therefore responsibility of their own health (Cohen Rodrigues et al., 2021). eHealth interventions are effective in the prevention and treatment of noncommunicable diseases such as CVD (Beishuizen et al., 2016; Lunde et al., 2018).

However, the willingness of CVD patients to use eHealth varies greatly (Anttila et al., 2019). While some are unwilling to use eHealth due to a lack of skills or interest, others are genuinely interested in using such technology. Identifying these preferences is important as healthcare professionals indicate that the views of their patients are decisive in their decision to use eHealth in their care (Walsh et al., 2018). Many qualitative studies have investigated the views of CVD patients on self-management and eHealth (e.g. Qui et al., 2020; Vosbergen et al., 2013; Walsh et al., 2018). These studies show that patients recognise their own responsibility

and role in improving their health, but at the same time need support to achieve a feeling of control over their health (e.g., to help motivate them). However, a quantitative approach investigating patients' needs for different types of lifestyle support is missing. Furthermore, given that patients' needs related to lifestyle support are context-dependent, it would be important to investigate such preferences in the Dutch cardiac care context (van Gemert-Pijnen et al., 2011).

In this study, we will elaborate on a previous study (Anttila et al., 2019) by not only investigating CVD patients' lifestyle support preferences, but also what demographic variables predict these. Furthermore, we will not only ask patients' whether they would like to use eHealth or not, but also further specify the type of eHealth or face-to-face intervention (e.g. individually or in a group) they would prefer. Our research question is therefore "What demographic characteristics predict patients' lifestyle support preferences?" More knowledge about patients' preferences could help provide them the type of lifestyle support that fits their needs, while overcoming abovementioned barriers in the healthcare domain.

METHOD

Design and Sample

We used a cross-sectional study design. People were recruited via the Dutch Harteraad Patient Panel, the official national Dutch CVD patients' association. The panel consists of 2600 members, who are either a patient diagnosed with a heart or vascular disease, or are a close relative to a CVD patient. On a regular basis, the members of the panel receive questionnaires from healthcare professionals, researchers and policymakers to investigate their experiences with cardiovascular health. We included people of 18 years and older who had been diagnosed with one or multiple heart disease(s) (diseases related to the heart, e.g. coronary heart disease), vascular disease(s) (diseases related to the blood vessels, e.g. peripheral artery disease), or both. Panel members who were a close relative to a CVD patient were excluded.

A priori power calculations (Faul et al., 2007) were based on the whole questionnaire, which included questions for multiple research projects (see Procedure and measures), and therefore multiple types of analyses. These calculations showed a required number of 550 respondents, but we continued recruiting after this number as the panel also consisted of close relatives (which would be excluded afterwards) to ensure a sufficient sample size. Respondents were not compensated for their participation. Of the 2600 members who were invited, 792 filled out (part of) the questionnaire. Of this number, 133 respondents were excluded as they were a close relative. Post-hoc power calculations (Faul et al., 2007) based on a logistic regression analysis with an alpha of .05 and a power of

.80 showed that this number was high enough to find an effect of demographic variables on lifestyle support preferences.

Procedure and measures

The study was approved by the Psychology Research Ethics Committee of Leiden University (2020-03-18-T. Reijnders-V1-2312). An email was sent by the Harteraad, inviting respondents to fill out the online questionnaire. After reading and agreeing to the online consent form, respondents were asked whether they were a CVD patient or a close relative to a patient. Next, we asked about the type of CVD (heart or vascular disease), and to complete several general demographic questions (gender, age, education, income, level of social support). All questions were selected and formulated by multiple researchers, and both professionals and experts in the field of CVD. Given the length of the questionnaire and to limit the burden on the patients, we decided to measure these demographics with a single item for each variable. The responses to the demographic variables education and income were transformed into a categorical variables with the categories low, middle and high (CBS, 2019; Nagelhout et al., 2012; Reinwand et al., 2018).

Next, we asked respondents about the type of lifestyle support they would ("If you would start working on your lifestyle, what kind of support would you prefer? Multiple answers are possible."). Respondents could choose one or multiple of the following options: (1) self-supportive (without support from a coach, app or family or friends), (2) support by a coach, in a group on location, (3) support by a coach, individually on location, (4) support by a coach via an app or internet, (5) support by family and friends, (6) working independently via an app or internet without coach, or (7) being in touch with other CVD patients via an app or internet. The question and response options were replicated from a large scale study about the evaluation of an eHealth intervention for cardiovascular disease patients (part of the BENEFIT project (Breeman et al., 2021). The responses to the lifestyle support preference question were transformed into binary variables, indicating whether respondents had selected the particular support type or not. This resulted in 7 variables for each individual lifestyle support type.

The remainder of the questionnaire concerned questions relevant for related research projects (preferences with regard to financial incentives for health behaviour change). At the end of the questionnaire, respondents were debriefed and thanked for their participation. They were provided with a short summary of the results of the study a few weeks afterwards.

Analyses

To analyse the relationship between demographic characteristics and lifestyle support preferences, we conducted subgroup analyses with five separate analyses. We ran chi-square tests of independence with the demographic predictors gender, education, and income, and univariate logistic regression analyses with the predictors age and social support. Preference for being self-supportive, support by a coach in a group, by a coach individually, by a coach via an app or internet, support by family and friends, working independently via an app or internet, and having contact with other CVD patients via an app or internet were the seven outcome variables. Next, to investigate the relative importance of the predictors, we ran multivariate logistic regression models including all 5 demographic predictors. Again, one of the 7 support types was added as outcome variable.

RESULTS

Descriptives

A total of 792 respondents filled out our questionnaire. Of this sample, 133 respondents indicated to be a close relative to a patient and therefore excluded. 659 respondents had once in their lifetime been diagnosed with a heart disease, vascular disease, or both, and were therefore included in our analyses. The mean age was 66 years old (SD = 11.20), and 65% of the respondents were men. Half of the respondents (49.8%) had a high level of education (29.7% middle, and 20.3% low level), and a third of the respondents (35.4%) had a high income (42.2% middle, and 22.5% low income).

Table 1. Demographics (means (SD) or frequencies (%)).

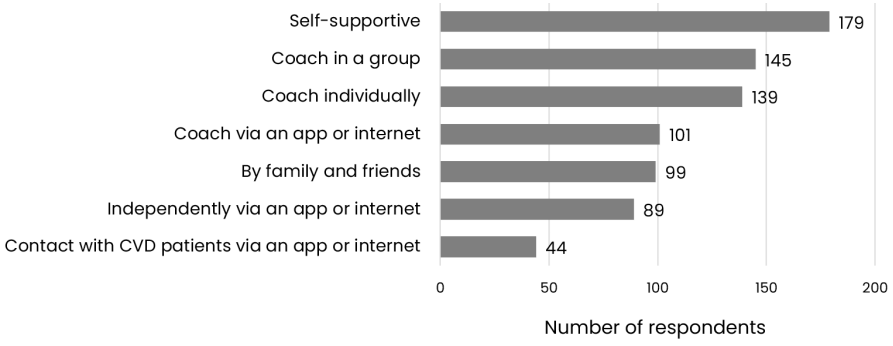
	CVD patients (N = 659)
Age (years), M (SD)	66.08 (11.20)
Gender, n(%)	
Female	230 (34.9)
Male	429 (65.1)
Education, n(%)	
Low	134 (20.3)
Middle	196 (29.7)
High	327 (49.8)

Table 1. *Continued*

	CVD patients (N = 659)
Age (years), M (SD)	66.08 (11.20)
Income, n(%)	
Low (<= €1500)	148 (22.5)
Middle (€1501 – €2500)	278 (42.2)
High (>= €2500)	233 (35.4)
Family status, n(%)	
No partner	143 (21.7)
Partner, living apart	19 (2.9)
Partner, living together	497 (75.4)
Disease status, n(%)	
Heart disease	343 (52.1)
Vascular disease	149 (22.6)
Both heart and vascular disease	167 (25.3)

Looking at the preferred type of lifestyle support of the total sample, a majority of the respondents would prefer to be self-supportive, without a coach, an app or internet, or family and friends (n = 179, 27.2%), followed by being supported by a coach (face-to-face) in a group (n = 145, 22.0%) or individually (n = 139, 21.1%). The least preferred types of lifestyle support were using an app or internet to work independently on one's lifestyle (n = 89, 13.5%) or to be in touch with other CVD patients (n = 44, 6.7%). See Figure 1 for the frequencies of all support types.

Figure 1. Lifestyle support preferences, from most frequently to least frequently chosen.



Demographic variables predicting lifestyle support preferences

All the results discussed below can be found in Table 2.

Gender

Women were more likely to prefer being supported by a coach individually ($\chi2(1) = 13{,}715$, $p < .001$), or by a coach via an app or internet ($\chi2(1) = 22.158$, $p < .001$). Men were more likely to prefer being supported by friends and family ($\chi2(1) = 5.826$, $p = .016$), or to be self-supportive, without coach, app/internet or family/friends ($\chi2(1) = 12.802$, $p < .001$). We found no differences in gender for the preference of being supported by a coach in a group, working independently via an app or internet, or having contact with CVD patients via an app or internet.

Age

If age increased with one year, the likelihood of preferring being supported by a coach, in a group decreased with 1.8% ($\chi2(1) = 5.168$, $p = .023$), by a coach, individually decreased with 4.0% ($\chi2(1) = 25{,}557$, $p < .001$), by a coach via an app or internet decreased with 3.5% ($\chi2(1) = 15.062$, $p < .001$). However, if age increased with one year the likelihood of preferring to be self-supportive, without coach, app/internet or family/friends increased with 2.9% ($\chi2(1) = 11.468$, $p = .001$). We found no significant relationship between age and working independently via an app or internet, having contact with CVD patients via an app or internet, or being supported by friends and family .

Education and Income

We found no significant relationships between education level (low, middle, high) or income level (low, middle, high) and any of the lifestyle support types.

Social support

If social support increased with one unit, likelihood of preferring being supported by a coach individually decreased with 30.1% ($\chi2(1) = 20.938$, $p < .001$), while the likelihood of preferring being supported by friends and family increased with 39.3% ($\chi2(1) = 9.423$, $p = .002$). We found no significant relationships between social support and being supported by a coach in a group, by a coach via an app or internet, working independently via an app or internet, having contact with CVD patients via an app or internet, or being self-supportive, without a coach, app/internet or family/friends.

Overall predictive model including all demographic variables

To check the relative importance of the predictors, we conducted multivariate logistic regressions with all demographic variables included. These analyses showed that all demographic variables were only significantly predictive for the preference of being self-supportive ($\chi2(7) = 25.476$, $p = .001$), supported by

a coach individually ($\chi2(7) = 45.185$, $p < .001$), by a coach via an app or internet ($\chi2(7) = 31.665$, $p < .001$), and by friends and family ($\chi2(7) = 14.813$, $p = .038$).

Men ($p = .005$), with a higher age ($p = .017$) and a middle income (compared to a low income; $p = .037$) were most likely to be self-supportive. This is in line with the univariate analyses, only with the addition of a middle income. Younger patients ($p < .001$) with a lower level of social support ($p < .001$) were most likely to prefer support by a coach individually. Patients with a higher level of social support ($p = .014$) were most likely to prefer support by family and friends. Women ($p = .001$) with a younger age ($p = .010$) were most likely to prefer support by a coach via an app or internet. These results are all in line with the univariate analyses. All results of the multivariate logistic regressions can be found in Appendix 1.

Table 2. Univariate logistic regression and Chi square cross tabulation analyses of demographic variable predictors on lifestyle support preferences.

	Gender			**Age**		**Education**				**Income**				**Social support**	
	Male (N=429)	**Female (N=230)**				**Low (N=134)**	**Middle (N=196)**	**High (N=327)**		**Low (N=148)**	**Middle (N=278)**	**High (N=233)**			
Self-supportive	136 (31.7%)	43 (18.7%)	$\chi2(1) = 12.802$, $p < .001$**	Exp(B) = 1.029	$\chi2(1) = 11.468$, $p = .001$**	39 (29.1%)	54 (27.6%)	86 (26.3%)	$\chi2(2) = .390$, $p = .823$	42 (28.4%)	67 (24.1%)	70 (30.0%)	$\chi2(2) = 2.405$, $p = .300$	Exp(B) = 1.165	$\chi2(1) = 3.625$, $p = .057$
Coach in a group	85 (19.8%)	60 (26.1%)	$\chi2(1) = 3.434$, $p = .064$	Exp(B) = .982	$\chi2(1) = 5.168$, $p = .023$*	20 (14.9%)	46 (23.5%)	78 (23.9%)	$\chi2(2) = 4.820$, $p = .090$	33 (22.3%)	66 (23.7%)	46 (19.7%)	$\chi2(2) = 1.191$, $p = .551$	Exp(B) = .955	$\chi2(1) = .311$, $p = .577$
Coach individually	72 (16.8%)	67 (29.0%)	$\chi2(1) = 13,715$, $p < .001$**	Exp(B) = .960	$\chi2(1) = 25.557$, $p < .001$**	27 (20.1%)	42 (21.4%)	69 (21.1%)	$\chi2(2) = 0.82$, $p = .960$	37 (25.0%)	55 (19.8%)	47 (20.2%)	$\chi2(2) = 1.762$, $p = .414$	Exp(B) = .695	$\chi2(1) = 20.938$, $p < .001$**
Coach via an app or internet	45 (10.5%)	56 (24.3%)	$\chi2(1) = 22.158$, $p < .001$**	Exp(B) = .965	$\chi2(1) = 15.062$, $p < .001$**	16 (11.9%)	30 (15.3%)	55 (16.8%)	$\chi2(2) = 1.740$, $p = .419$	25 (16.9%)	48 (17.3%)	28 (15.3%)	$\chi2(2) = 3.052$, $p = .217$	Exp(B) = .887	$\chi2(1) = 1.697$, $p = .193$
Friends and family	75 (17.5%)	24 (10.4%)	$\chi2(1) = 5.826$, $p = .016$*	Exp(B) = 1.015	$\chi2(1) = 2.070$, $p = .150$	21 (15.7%)	29 (14.8%)	49 (15.0%)	$\chi2(2) = 0.051$, $p = .975$	18 (12.2%)	47 (16.9%)	34 (14.6%)	$\chi2(2) = 1.755$, $p = .416$	Exp(B) = 1.393	$\chi2(1) = 9.423$, $p = .002$*
Indepen-dently via an app or internet	54 (12.6%)	35 (15.2%)	$\chi2(1) = .887$, $p = .346$	Exp(B) = .989	$\chi2(1) = 1.143$, $p = .285$	18 (13.4%)	18 (9.2%)	53 (16.2%)	$\chi2(2) = 5.165$, $p = .076$	17 (11.5%)	35 (12.6%)	37 (15.9%)	$\chi2(2) = 1.840$, $p = .398$	Exp(B) = .845	$\chi2(1) = 3.060$, $p = .080$
Contact with CVD patients via app or internet	26 (6.1%)	18 (7.8%)	$\chi2(1) = .749$, $p = .387$	Exp(B) = .979	$\chi2(1) = 2.770$, $p = .096$	9 (6.7%)	17 (8.7%)	18 (5.5%)	$\chi2(2) = 1.969$, $p = .374$	11 (7.4%)	23 (8.3%)	10 (4.3%)	$\chi2(2) = 3.400$, $p = .183$	Exp(B) = .792	$\chi2(1) = 3.359$, $p = .067$

* $p < .05$, ** $p < .001$

DISCUSSION AND CONCLUSION

Discussion

We aimed to discover the lifestyle support preferences of CVD patients, specified by demographic characteristics. We found that the majority of the patients preferred being self-supportive when working on one's lifestyle, followed by being supported by a coach. The least preferred options were using eHealth independently or to being in touch with other CVD patients. More specifically, women were most likely to prefer individual coaching, either in a face-to-face setting or via an eHealth tool. Men on the other hand were most likely to prefer either support from family and friends, or be self-supportive when working on their lifestyle, without any support from a coach, eHealth, or family and friends. Younger patients were more likely to prefer support from a coach, either face-to-face individually or in a group, or via an eHealth tool, while older patients were more likely to prefer being self-supportive. Patients who indicated to have lower levels of social support were more likely to prefer individual face-to-face support from a coach, but less likely to prefer support from family and friends.

The high preference for being self-supportive may be explained through several factors. Firstly, the majority of our sample consisted of men (65.1%) and our subgroup analyses showed that men seem to be less interested in lifestyle support from a coach or digital tools. This finding is in line with studies showing a gender difference in health seeking behaviours (Yousaf et al., 2015), and that men perceive traditional lifestyle interventions as more suitable for women (Gavarkovs et al., 2016). As especially men have an increased risk of developing CVD and ending up in cardiac rehabilitation compared to women (De Boer et al., 2020b; Virani et al., 2020), it would be important to make lifestyle support more attractive for them. It would be important to spike this interest, as lifestyle interventions are effective in improving CVD risk factors (Janssen et al., 2013). Although men currently show a lack of interest for eHealth, digital tools could be the solution to increase men's interest for lifestyle support. As eHealth can be tailored to individual needs (Krebs et al., 2010), it is more capable than traditional face-to-face lifestyle interventions to meet men's wishes and needs, and thus to make the intervention more attractive to them. Especially as men generally have greater technological affinity (Zhang et al., 2014), such possibilities would be worthwhile to consider. Given our results, another possibility would be to engage family and friends in the lifestyle improvement of men. A study shows that healthcare professionals do recognise the involvement of family members in practice (Birtwistle et al., 2021). Family can help translate healthy lifestyle advice from the consultation room to the home environment, or can help regulate the patient's lifestyle behaviour. Family and friends are an important factor in the behaviour change process and stimulate intervention adherence (Brandt et al., 2018; Miller et al., 2013). The social network could therefore be employed

in behaviour change interventions, not only by using the direct network of the patient, but also by creating one in a digital environment (Latkin et al., 2015). Another explanation for the high preference for being self-supportive could be because of our sample. Members of the Harteraad panel represent a group of patients who are likely to have already underwent cardiac rehabilitation, who are more empowered and self-aware of their disease and its consequences. As they probably already learned about lifestyle management, they would be less likely to need any support. It would be interesting for future research to investigate whether CVD patients' lifestyle support preferences differ in the pre- and post-cardiac rehabilitation phase.

Older patients also indicated to be less interested in lifestyle support from a coach, which could be explained by physical restrictions to engage in physical activity (de Boer et al., 2020a). As older patients might experience regular interventions as too physically challenging, or might have physical difficulties to even reach the professional's facilities, they could be less willing to engage in lifestyle support. Again, despite their current lack of interest, tailoring through eHealth could also be useful to promote lifestyle support among older patients (Aalbers et al., 2011). Using eHealth's tailoring capabilities to adapt programmes to older patients' individual physical capabilities could increase their acceptance of lifestyle support, and help those older patients' who have difficulties in reaching the cardiac rehabilitation facilities. It would be worthwhile to consider offering eHealth to an older target population, given that studies show that eHealth interventions are effective in reducing cardiac risk factors among an older people (Beishuizen et al., 2016). Furthermore, older people benefit from a good social environment while working on their lifestyle (Chaudhury et al., 2016). Online tools could therefore be useful for them to get in touch with peers to help them engage in healthy behaviours. Nevertheless, our results indicate that there remains a need to increase the attractiveness of digital tools for an older target population to address their personal needs.

Furthermore, our findings with regard to social support are in line with previous studies. These show that patients with low levels of social support generally have more severe cardiac symptoms, but are also less adherent to interventions (McBrien et al., 2017; Miller et al., 2013). The support of a coach could therefore be particularly important for them. However, although other studies indicate that the social environment could be an important contributor to successful behaviour change (Brandt et al., 2018; McBrien et al., 2017; Miller et al., 2013), our results suggest that patients with lower levels of social support are less likely to prefer support from family and friends. This could be due to the lower availability of family and friends to do so. In that case, creating a social support group (e.g. in a digital environment) could be a solution (Latkin et al., 2016). It would be important though to further investigate whether patients with lower levels of social support would be interested in such forms of lifestyle interventions.

Finally, with regard to the use of eHealth, it is interesting to see that there is a higher preference for the options in which a coach is involved, compared to the option in which eHealth is used either independently, or with other CVD patients. This result is in line with those of previous studies focused on eHealth interventions, which show that the presence of human support is positively related to intervention effectiveness and adherence (Etzelmueller et al., 2020; Karyotaki et al., 2018; Richards & Richardson, 2012). These findings could be due to a need of a relationship between patient and professional (Brandt et al., 2018), which is called the 'working alliance' in clinical terms (Hatcher & Barends, 2006). Studies show that a good working alliance is related to intervention adherence and effectiveness in face-to-face settings (Goldberg et al., 2013; Martin et al., 2000), but also within eHealth interventions (Flückiger et al., 2018; Sucala et al., 2012). As eHealth is becoming increasingly relevant, for example due to the recent COVID-19 pandemic (Bokolo, 2021), it is not unlikely that it will also be increasingly used within cardiac rehabilitation. However, our results show that it remains important to combine eHealth with human attention and support to meet the needs of CVD patients.

Although we had a large number of respondents, and therefore a good representation of the CVD population, a limitation of our study was its digital nature. Although the gender distribution and age of our sample largely corresponds with those of the general CVD population (see e.g. De Boer et al., 2020b), it could be that mostly patients with digital affinity responded to our survey. Future studies could investigate lifestyle support preferences in face-to-face settings (e.g. rehabilitation centres), increasing the chances of including patients with low digital literacy. Furthermore, as mentioned previously, the Harteraad panel consists of CVD patients who are likely to have already underwent cardiac rehabilitation. We would advise future researchers to include CVD patients who did not start rehabilitation yet, to investigate how this might influence their lifestyle support preferences. Finally, although our questionnaire was developed with the expertise of researchers, professionals and experts in the field of CVD, our questions have not been tested for reliability and validity. We would advise future studies to develop valid and reliable measures to assess lifestyle support preferences.

Innovation

Our study contributes to the innovation of cardiac rehabilitation by not only investigating CVD patients' lifestyle support preferences, but also what demographic variables predict these. Furthermore, we gained more specific knowledge about the type of eHealth or face-to-face intervention they would prefer. While the findings show that there is a need to increase the attractiveness of digital tools for older men, we also found that younger women are more positive about using eHealth. The increasing development and use of tele-revalidation

could ensure that the needs of underrepresented groups within cardiac care (e.g. younger women) will be met by providing lifestyle support (which is often still provided face-to-face in a group setting) in a different way. Furthermore, although changes in society ask for an increasing use of eHealth (e.g. Bokolo, 2021), our findings show that human contact remains essential during these innovations. The findings could be applied in the provision of patient-centred care, and help collaborate patients and professionals in the provision of a lifestyle intervention that best fits the individual. For example, our findings could help professionals working in cardiac care provide the right type of lifestyle support to their patients, and eHealth developers in the innovation of lifestyle interventions that meet the needs and wishes of patients themselves. This would increase the attractiveness of lifestyle for CVD patients, leading to healthier lifestyles, and therefore a lower risk of future cardiac events.

CONCLUSION

To optimise lifestyle interventions as prevention and treatment of CVD, we investigated CVD patients' preferences with regard to lifestyle support. Men and older patients are generally more interested in being self-supportive while working on their lifestyle, and patients with lower levels of social support might be in need of extra support outside their social network. As lifestyle interventions are effective in improving CVD risk factors, it would be important lifestyle support more attractive for older men. eHealth could potentially provide a solution, but attention should be paid to spike their interest for digital interventions. This knowledge could help to provide patients the right type of lifestyle support, and to further investigate how to reach patients for whom current forms of support are not yet attractive enough. Based on our findings, future studies could focus on the role of comorbidities, patient-provider communication, the content of lifestyle support, and emotional factors within lifestyle and the lifestyle support for people with CVD.

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CHAPTER 3 | APPENDIX 1

1. Multivariate logistic regression analyses of demographic variables predictors on preference for being self-supportive (without coach, app/internet, or family/friends).

	χ2	df	P-value
Model	25.476	7	.001*

	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	-.647	.229	7.969	.005*	.524	.334	.821
Age	.022	.009	5.714	.017*	1.022	1.004	1.041
Education							
Middle (vs. low)	.011	.257	.002	.966	1.011	.611	1.673
High (vs. low)	-.129	.248	.269	.604	.879	.541	1.430
Income							
Middle (vs. low)	-.523	.251	4.360	.037*	.593	.363	.968
High (vs. low)	-.334	.277	1.458	.227	.716	.416	1.231
Social support	.096	.085	1.295	.255	1.101	.933	1.299

CI, confidence interval; *, significant values (p < .05)

2. Multivariate logistic regression analyses of demographic variables predictors on preference for a coach in a group.

	χ2	df	P-value
Model	12.224	7	.093

	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	.178	.226	.615	.433	1.194	.766	1.862
Age	-.014	.009	2.768	.096	.986	.969	1.003
Education							
Middle (vs. low)	.549	.300	3.346	.067	1.732	.691	3.120
High (vs. low)	.642	.289	4.940	.026*	1.900	1.079	3.346
Income							
Middle (vs. low)	.133	.258	.267	.605	1.142	.690	1.893
High (vs. low)	-.129	.298	.189	.664	.879	.490	1.575
Social support	-.009	.086	.010	.920	.991	.837	1.174

CI, confidence interval; *, significant values (p < .05)

3. Multivariate logistic regression analyses of demographic variables predictors on preference for a coach individually.

	χ2			df		P-value	
Model	45.185			7		.000*	
	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	.390	.230	2.875	.090	1.476	.941	2.317
Age	-.035	.009	15.639	.000*	.966	.950	.983
Education							
Middle (vs. low)	-.126	.293	.185	.667	.882	.497	1.565
High (vs. low)	-.053	.279	.036	.849	.948	.549	1.639
Income							
Middle (vs. low)	-.015	.264	.003	.955	.985	.588	1.652
High (vs. low)	.295	.302	.956	.328	1.343	.744	2.425
Social support	-.318	.083	14.523	.000*	.728	.618	.857

CI, confidence interval; *, significant values ($p < .05$)

4. Multivariate logistic regression analyses of demographic variables predictors on preference for a coach via an app or internet.

	χ2			df		P-value	
Model	31.665			7		.000*	
	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	.870	.256	11.554	.001*	2.386	1.445	3.940
Age	-0.24	.009	6.669	.010*	.976	.958	.994
Education							
Middle (vs. low)	.156	.343	.208	.648	1.169	.597	2.288
High (vs. low)	.376	.323	1.350	.245	1.456	.773	2.744
Income							
Middle (vs. low)	.333	.291	1.317	.251	1.396	.790	2.467
High (vs. low)	.087	.347	.063	.801	1.091	.553	2.155
Social support	-.010	.099	.010	.921	.990	.816	1.202

CI, confidence interval; *, significant values ($p < .05$)

5. Multivariate logistic regression analyses of demographic variables predictors on preference for support by family and friends.

	χ2	df	P-value
Model	14.813	7	.038*

	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	-.469	.286	2.675	.102	.626	.357	1.097
Age	.007	.011	.383	.536	1.007	.985	1.029
Education							
Middle (vs. low)	.059	.320	.034	.853	1.061	.567	1.986
High (vs. low)	.034	.305	.013	.910	1.035	.569	1.883
Income							
Middle (vs. low)	.127	.318	.159	.690	1.135	.609	2.117
High (vs. low)	-.194	.362	.288	.591	.823	.405	1.673
Social support	.291	.118	6.058	.014*	1.338	1.061	1.688

CI, confidence interval; *, significant values ($p < .05$)

6. Multivariate logistic regression analyses of demographic variables predictors on preference for working independently via an app or internet.

	χ2	df	P-value
Model	13.137	7	.069

	B	SE	Wald	P-value	Exp (B)	95% CI for Exp (B)	
						Lower	Upper
Gender (female)	.278	.272	1.040	.308	1.320	.774	2.251
Age	-.009	.010	.798	.372	.991	.971	1.011
Education							
Middle (vs. low)	-.577	.363	2.530	.112	.561	.276	1.144
High (vs. low)	.048	.316	.023	.880	1.049	.565	1.947
Income							
Middle (vs. low)	.242	.330	.538	.463	1.274	.667	2.433
High (vs. low)	.594	.366	2.640	.104	1.811	.885	3.709
Social support	-.182	.099	3.341	.068	.834	.686	1.013

CI, confidence interval; *, significant values ($p < .05$)

7. Multivariate logistic regression analyses of demographic variables predictors on preference for having contact with other CVD patients via an app or internet.

	χ2	**df**	**P-value**
Model	9.057	7	.249

	B	**SE**	**Wald**	**P-value**	**Exp (B)**	**95% CI for Exp (B)**	
						Lower	**Upper**
Gender (female)	-.061	.367	.027	.869	.941	.458	1.933
Age	-.017	.013	1.599	.206	.983	.958	1.009
Education							
Middle (vs. low)	.308	.439	.491	.483	1.360	.575	3.216
High (vs. low)	-.055	.446	.015	.902	.947	.395	2.268
Income							
Middle (vs. low)	.257	.403	.407	.524	1.293	.587	2.850
High (vs. low)	-.340	.509	.445	.505	.712	.262	1.932
Social support	-.196	.130	2.258	.133	.822	.637	1.061

CI, confidence interval; *, significant values ($p < .05$)