Comparing an online health check with traditional nurse-led health examinations among the long-term unemployed: A comparison study

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Submitted to: Journal of Medical Internet Research
on: June 09, 2023

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Abstract

Background: An online health check can be used to screen health behavior risks in the population, help health care professionals with standardized risk estimation for their patients, and motivate a patient to change unhealthy behaviors. The long-term unemployed comprise a particular subgroup with an increased risk of lifestyle-related diseases.

Objective: This study aims to investigate the clinical utility of a general online health examination, the STAR Duodecim Health Check and Coaching Program (hereafter, STAR), which was developed in Finland, in the targeted screening of the long-term unemployed. For this purpose, we compared the health challenges identified by an online health check with those identified by a nurse during a face-to-face health check for the unemployed.

Methods: In this mixed-methods validation study, 49 unemployed participants attending a health check were recruited from two Finnish primary health care centers. The participants used STAR and attended a nurse's health check. Data were collected by surveys with multiple-choice and open-ended questions from the participants, nurses, and a study assistant who observed the session. The health challenges identified by STAR were compared with the three most important health challenges identified by the nurses. The health challenges were categorized and the percentages of agreement between STAR and the nurses and the confidence intervals of the percentages were calculated. The health challenges not recognized by STAR were identified.

Results: STAR identified a total of 365 health challenges, an average of 7.4 health challenges per participant (n=49). The nurses noted 160 challenges among the top-three most significant health challenges (n=47). In 53.2% of the cases (25/47), STAR identified all categorized health challenges named by the nurses (95% CI [38.1, 67.9]). In 63.8% of cases (30/47), STAR identified at least 2/3 of the health challenges identified by the nurse (95% CI [48.5, 77.3]). STAR left a total of 89 health challenges, an average of 1.8 per participant, uncategorized, because STAR lacked an answer to the question(s) required for the classification of a certain health challenge. The participants were most often not able to add information on their blood pressure (36/49, 73.5%), cholesterol (22/49, 44.9%), and waist circumference (15/49, 30.6%).

Conclusions: In conclusion, STAR identified most of the health challenges identified by the nurses but missed some essential ones. Unemployed participants did not have information on measurements such as blood pressure and cholesterol values, which are pivotal in assessing cardiovascular risks. Using the tool for screening or as a part of a traditional health check with necessary measurements and dialog with health care professionals may improve the risk assessments and streamline the health checks of the unemployed. Clinical Trial: This study was approved by the Ethics Committee of the Expert Responsibility Area of Tampere University Hospital in June 2020 (ETL Code R20067).

(JMIR Preprints 09/06/2023:49802)
DOI: https://doi.org/10.2196/preprints.49802

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Methods: In this comparison study, 49 unemployed participants attending a health check were recruited from two Finnish primary health care centers. The participants used STAR and attended a nurse's health check. Data were collected by surveys with multiple-choice and open-ended questions from the participants, nurses, and a study assistant who observed the session. The nurses were asked to name the three most significant health challenges for each participant. These health challenges were categorized into health challenges corresponding to STAR and these were compared with each other. Percentages of agreement between STAR and the nurses were calculated. Sensitivity and specificity, as well as Cohen's Kappa with *P* values and confidence intervals were computed for the agreement.

Results: STAR identified a total of 365 health challenges, an average of 7.4 health challenges per participant (n=49). The nurses named a total of 160 health challenges (n=47). In 53.2% of the cases (25/47), STAR identified all categorized health challenges named by the nurses (95% CI [38.1, 67.9]). In 63.8% of cases (30/47), STAR identified at least 2/3 of the health challenges identified by the nurse (95% CI [48.5, 77.3]). Cohen's kappa was 0.877 (*P*<.001) for alcohol indicating almost perfect agreement and 0.440 (*P*<.001) for smoking and 0.457 (*P*=.001) for cholesterol indicating moderate agreement. STAR left a total of 89 health challenges, an average of 1.8 per participant, uncategorized, because STAR lacked an answer to the question(s) required for the classification of a certain health challenge. The participants did not always add information on their blood pressure (36/49, 73.5%), cholesterol (22/49, 44.9%), and waist circumference (15/49, 30.6%).

Conclusions: In conclusion, STAR identified most of the health challenges identified by the nurses but missed some essential ones. Participants did not have information on measurements such as blood pressure and cholesterol values, which are pivotal to STAR in assessing cardiovascular risks. Using the tool for screening or as a part of a traditional health check with necessary measurements and dialog with health care professionals may improve the risk assessments and streamline the health checks of the unemployed.

KEYWORDS: chronic illnesses; eHealth; health care services; lifestyle; long-term unemployed; online health check; online intervention; primary prevention; risk assessment; risk factors

Introduction

Background

Long-term illnesses and multimorbidity have become more common, thus reducing quality of life and increasing the demand for health care services [1,2]. Lifestyle choices have a significant impact on the expected onset of diseases, age of death, risk factors concerning long-term illnesses, and multimorbidity [1,3-5]. Preventable lifestyle-related risk factors affecting chronic morbidity and mortality have been recognized, most notably smoking, the harmful use of alcohol, physical inactivity, and an unhealthy diet [5,6].

So-called eHealth uses digital information and communication technologies for health, demonstrating the growing potential to make health services more accessible, efficient, and cost-effective [7,8]. Online health checks, an eHealth tool aimed at assessing lifestyle-related risk factors, could improve primary prevention in health care [9-11]. An online health check can be used to screen health behavior risks in the population, help health care professionals with standardized risk estimation for their patients, and motivate a patient to change unhealthy behaviors [9]. Web-based interventions focusing on health behavior-related risks have been reported to have an overall positive effect on the user's health, resulting in positive behavior changes [11-13]. Assessing multiple lifestyle-related risks at the same time provides an opportunity to review one's health comprehensively and target multiple health-related risk behaviors simultaneously [9]. Such interventions have been well-received by patients compared to interventions targeting only one health-related behavior [9,12-14].

The STAR Duodecim Health Check and Coaching Program (hereafter, STAR) is a general online health examination developed by Duodecim Publishing Company Ltd and the Finnish Institute of Health and Welfare [15-17]. The abbreviation STAR comes from the Finnish words for an online health check. STAR gives users a report that includes an evaluation of their life expectancy and an estimated risk for developing common long-term illnesses based on questions about personal characteristics, health information, lifestyle, mental wellbeing, and relationships. In addition, STAR provides coaching courses from which users can choose the most suitable based on STAR's recommendations. Thus, STAR provides tools for further improvement and long-term tracking of health. Users can set personal goals, participate in coaching, and follow up the development of their health over time. STAR and its report are further described in the study protocol and Multimedia Appendix 1 [18]. Previous studies of STAR have mainly focused on creating a persuasive system design [18-21].

STAR's life expectancy evaluation and the risk evaluations are based on previous Finnish studies, namely the Finriski, Autoklinikka, and Minisuomi studies [15,22-24]. The information provided by risk calculators can help health care professionals identify risk categories more accurately and improve the likelihood of prescribing medicine to high-risk patients, thereby helping with decision-making [25]. On the other hand, there is a huge variety of health risk calculators available online. A systematic review of online cardiovascular disease risk calculators found wide variation in risk assessment models, risk presentation, and results [26]. This study also found the risk calculators to have overall poor actionability, and that the available risk calculators often lack clinical validity [26].

The long-term unemployed comprise a particular subgroup with an increased risk of lifestyle related diseases [27]. Long-term unemployment is linked to greater than average morbidity, earlier expected age of death, and increased risk of mortality [27,28]. Long-term unemployment is defined as having been unemployed for 12 months or more [29]. The duration of unemployment increases the burden

of disease [30]. Unemployment also affects self-assessed health negatively, and the strongest association is found in people with a lower socioeconomic status, weak social networks, and health-related reasons for unemployment [31]. There is also some evidence that unemployed people use preventive services less in Finland [32]. There have been studies on online health checks and internet-based risk assessments of subgroups such as the employed, but there have been few studies focusing on online health checks for the unemployed [33].

Although the general health checks for the unselected population may not be cost-effective in reducing illness and mortality [34], targeted screening could be useful if it leads to action (by the unemployed or by the service system) [32]. The lack of benefit of health checks may be due to the fact that those who would need them the most do not participate in them [34]. Furthermore, there is not enough evidence on the potential clinical utility of online health checks in targeted health risk screening. While online health checks performed by citizens themselves may hold potential for the low-cost screening of targeted populations, more evidence is needed regarding their ability to identify health risks in these sub-groups.

Goal of This Study

This study aims to investigate the clinical utility of an online health check in screening targeted at the long-term unemployed. For this purpose, we compare the health challenges identified by an online health check with those identified by nurses during a face-to-face health check for the unemployed. We report the agreement and differences in health challenges identified by the online health check and the nurse's check.

Methods

Recruitment

The inclusion criteria for participation in the study was unemployment for at least 12 months, age over 18 years old, and participation in a health check for long-term unemployed persons. Finland has a public health care system organized and financed by welfare counties, and every resident is entitled to receive social, health, and medical services [36,37]. According to the health care law, welfare counties are obliged to organize health checks for the unemployed [38]. The purpose of these health checks is to promote health and support the ability to function and work [39]. The initiative for a health check can come from the unemployed person, unemployment services, or the municipal social welfare administration.

We recruited 49 participants in total: 45 from Tampere and 4 from Espoo. The characteristics of the health check participants are described in Table 1. Three nurses from Tampere and three from Espoo health centers participated in the study. Two participants were excluded from the health challenge analysis due to a lack of data from the nurses. In these cases, the participants skipped the nurse's health examination or the nurse did not fill out the professional questionnaire. As a result, data were obtained from 47 participants.

Table 1. The characteristics of the health check participants.

Characteristics	Participants (n= 49)
Age mean (SD)	47.63 (10.38)

Gender n (%)	
Male	28 (57.1)
Female	21 (42.9)
Unemployment time in months (SD)	43.6 (55.28)
What did you do before you became unemployed? n (%)	
Studying	6 (12.2)
On sick leave	3 (6.1)
Working	32 (65.3)
Something else	8 (16.3)
Highest education n (%)	
Elementary school	9 (18.4)
Vocational education	23 (46.9)
Upper secondary education	9 (18.4)
Bachelor’s degree	5 (10.2)
Master’s degree	3 (6.1)
Do you have a long-term illness diagnosed by a doctor? n (%)**	
No	15 (30.6)
Yes	29 (59.2)
Don't know	6 (12.2)

** information is missing from three (3)*
***one (1) answered both yes and I don't know*

Procedure

The recruitment process started when the health center assistant (or in Espoo, a nurse) who booked an appointment for an unemployed person to have a nurse's health check told the person about the possibility to participate in this study. Those who expressed their willingness to participate in the study were scheduled for a health check on the research day.

The participants attended a health check for the unemployed at the local health center, gave their consent on a consent form and filled out participant questionnaire 1. Each participant filled out STAR and read its report while a study assistant observed and filled out the observer’s questionnaire. After reading the report, the participant filled out participant questionnaire 2. Next, the participant was directed to the nurse’s health check. After the nurse’s health check, the nurse filled out professional questionnaire 1 before reading the STAR report. In professional questionnaire 1, the nurse was asked to name the participant’s three most significant health challenges. Then the nurse read the STAR report and filled out professional questionnaire 2. A flow chart of the recruitment process and the content of the questionnaires is described in more detail in the study protocol [18].

The initial idea was that the order of STAR and the nurse’s health check would be reversed after every 10 check-ups [18] but implementing this proved difficult due to the nurses’ schedules, hence only a few cases (n=3) were done in reverse order.

The recruitment took place at two Finnish public health centers in Espoo and Tampere. Espoo and Tampere are the second and the third largest cities in Finland, with a population of 290,000 and 240,000, respectively [35].

After completing STAR, the participant received a report from STAR including a list of personal health challenges identified from the answers. The term “health challenge” means a medical condition, disease, habit, or lifestyle that poses the risk of disease or medical ailment. In the STAR report, health challenges are categorized into red, yellow, and green categories. STAR defines the categories as follows: red = “Please check – this is essential for your health”; yellow = “Please check and pay attention”; and green = “great, continue with the same pattern.” The STAR classification is based on the patient's answers to the STAR questions. According to the limit values, STAR classifies a total of 17 different health challenges into these aforementioned color-coded categories. The 17 health challenges are: body mass index, waist circumference, exercise, diet, sleep, stress, mental resources, community action, alcohol, smoking, cholesterol, diabetes, blood pressure, oral health, ability to work, relationships, and family.

The total number of STAR health challenges per participant is not limited; STAR can categorize any number of the 17 different health challenges into red or yellow health challenges. In contrast, a nurse was asked to name only the three most significant health challenges in the questionnaire in this study.

If the user has not answered a question(s) about a specific health challenge, STAR cannot classify it into any of the previous color-coded categories. In this case, this health challenge appears as a gray category in the STAR report. STAR announces to the user that there is no classification information for the health challenge in question, and STAR cannot take a position on it in this case.

Analysis Methods

The three top health challenges named by the nurse in the health check were compared to the health challenges found in the STAR report for the same person. These three health challenges named by the nurse were first classified according to the corresponding 17 categories in the STAR report so that they could be compared. Health challenges named by the nurse that could not be categorized into the same categories as in STAR remained uncategorized. They are referred to hereafter as "uncategorized."

We calculated the cases in which STAR identified all the same health challenges as nurses did and the cases in which STAR identified at least 2/3 of the health challenges determined by the nurses. We also report the top-four health challenges named by the nurse and STAR, respectively, the new health challenges STAR found, and any health challenges missed. We excluded work ability from the analyses because STAR does not classify work ability if the participant has answered that he/she is unemployed. In addition, we calculated for each health challenge the accuracy, sensitivity, specificity and agreement with Cohen's kappa value with confidence intervals and *P* value [40]. We performed a power analysis to determine the sample size necessary for detecting a moderate or higher agreement in our study. The analysis showed that 47 participants per condition would provide sufficient power (80%) to identify this agreement with a significance level of 0.05. We used R (Version 4.0.1, R Core Team) [41] with the packages caret [42] and irr [43] for computing the sensitivity, specificity, accuracy and Kappa-values. In all statistical analyses we considered *P* values <0.05 to be statistically significant.

Ethical considerations

This study was approved by the Ethics Committee of the Expert Responsibility Area of Tampere

University Hospital in June 2020 (ETL Code R20067).
All participants signed the written informed consent form to take part in the study. They were informed about the purpose of the research, the expected duration of their participation, and that their participation was voluntary and that they could discontinue it at any time without it causing them any harm. Participants' consent forms and all questionnaires collected in the study were archived. All questionnaires collected in the study were anonymized with numerical codes. Participants were not reimbursed and did not receive compensation for participating in the study.

Results

STAR predicted an average life expectancy of 78.1 years (SD 6.8) for the participants. STAR identified a total of 365 health challenges (n=49), an average of 7.4 health challenges per participant (Table 2). Nurses named a total of 160 top-three significant health challenges (n=47) (Table 2). Of these, 128 health challenges determined by the nurses were categorized into the same 17 categories as in the STAR report (Table 2, Figure 1). The remaining 32 health challenges named by the nurses could not be categorized in the STAR categories (Table 2, Figure 1). STAR left a total of 89 health challenges, an average of 1.8 per participant, uncategorized in the color-coded categories, because STAR lacked an answer to the question(s) required for classification for a certain health challenge (Table 2).

Table 2. Characteristics of the health challenges named by STAR and the nurses.

	STAR (n=49)	NURSES (n=47)
Health challenges: number (mean per participant)	365 (7.4)	160 (3.4)
STAR *red: number (mean per participant)	189 (3.9)	
STAR **yellow: number (mean per participant)	176 (3.6)	
Nurses' categorized***: number (mean per participant)		128 (2.7)
Nurses' uncategorized***: number (mean per participant)		32 (0.7)
STAR uncategorized***: number (mean per participant)	89 (1.8)	

red = "Please check – This is essential for your health"; yellow = "Please check and pay attention"*
**** "Able to categorize according to the corresponding 17 categories in the STAR report"*

In 53.2% of cases (25/47), STAR identified all categorized health challenges named by nurses (95% CI [38.1, 67.9]). In 63.8% of cases (30/47), STAR identified at least 2/3 of the health challenges identified by the nurse (95% CI [48.5, 77.3]).

Nurses most often named mental resources (27/47, 57.4%), blood pressure (14/47, 29.8%), cholesterol (13/47, 27.7%), and body mass index (10/47, 21.3%) as health challenges. STAR most often named diet (45/47, 95.7%), community action (38/47, 80.9%), body mass index (34/47, 72.3%), and mental resources (32/47, 68.1%) as health challenges. Community action and diet were seldomly named in the top-three health challenges by the nurses. Nurses did not name waist circumference, relationship or family among the health challenges. (Table 3)

Of the 105 categorized top-three health challenges named by the nurses, STAR recognized 72 (68.6%); 46 (63.9%) as red and 26 (36.1%) as yellow (Figure 1). STAR missed 33 (31.4%) of the 105 challenges categorized as the top-three health challenges by the nurses; STAR did not recognize 19 health challenges named by the nurses, and it was not even possible for STAR to recognize 14 of

the health challenges named by the nurses because STAR lacked an answer to the question(s) required for categorization (Figure 1). The 14 health challenges named by nurses that STAR could not recognize were mental resources (n=1), cholesterol (n=4), and blood pressure (n=9).

Figure 1. Flowchart of the different health challenges identified by the nurses and the online health check (STAR) in the study.

STAR and the nurses recognized alcohol (46/47, 97.9%), cholesterol (38/47, 80.9%) and smoking (36/47, 76.6%) as health challenges very similarly (Table 3). Participants were not able to respond to all questions due to a lack of knowledge of some measurement values, and this had an impact on STAR's ability to recognize blood pressure and cholesterol, which affected agreement between the nurses and STAR. Cohen's kappa was 0.877 (*P*<.001) for alcohol indicating almost perfect agreement and 0.440 (*P*<.001) for smoking and 0.457 (*P*=.001) for cholesterol indicating moderate agreement (Table 3).

STAR named a total of 262 new health challenges (127 red and 135 yellow) that were not named by the nurses. STAR most commonly named diet (15 times) and community action (35 times) as red health challenges, while the nurses did not name them among the three most significant health challenges.

Table 3. The matches of the health challenges in the nurse's and STAR's health checks. n=47.

	Nurse named	STAR named	Accuracy *	Sensitivity	Specificity	Cohen's kappa [95% CI]	*P* value (kappa)
Body mass index	10	34	0.404	0.8	0.297	0.052 [-0.105 - 0.208]	.542
Waist circumference	0	23	0.50	na	na	na	na
Exercise	6	20	0.617	0.667	0.610	0.138 [-0.082 - 0.359]	.201
Diet	7	45	0.191	1	0.050	0.015 [-0.009 - 0.039]	.545
Sleep	5	17	0.660	0.600	0.667	0.130 [-0.106 - 0.366]	.241
Stress	3	28	0.468	1	0.432	0.088 [-0.012 - 0.189]	.140
Mental resources	27	32	0.638	0.778	0.450	0.235 [-0.041 - 0.512]	.098
Community action	2	38	0.191	0.5	0.178	-0.034 [-0.12 - 0.053]	.257
Alcohol	4	5	0.979	1	0.977	0.877 [0.641 - 1]	<.001
Smoking	7	18	0.766	1	0.725	0.440 [0.2 - 0.68]	<.001
Cholesterol	13	8	0.809	0.462	0.941	0.457 [0.166 - 0.748]	.001
Diabetes	6	17	0.681	0.667	0.683	0.196 [-0.056 - 0.448]	.096
Blood pressure	14	9	0.681	0.286	0.848	0.150 [-0.144 - 0.443]	.285
Oral health	1	17	0.617	0	0.630	-0.042 [-0.122 - 0.038]	.447

Relationship	0	14	0.702	na	na	na	na
Family	0	9	0.801	na	na	na	na
TOTAL	105	334	0.608	0.686	0.595	0.1467 [0.09189 - 0.2016]	<.001

**Cases the nurse and STAR agreed (= both named or neither named a health challenge)*
***na - can not be computed since nurse did not find any of the participants to have these conditions.*

STAR left a total of 89 health challenges, an average of 1.8 per participant, unassigned according to the color-coded categories, because STAR lacked an answer to the question(s) required for classification to a certain health challenge (Table 2). This means that STAR does not analyze and categorize a health challenge into any color-coded category in the STAR report if it lacks the information necessary for classification, such as information about waist circumference or cholesterol values, as mentioned above. The participants did not most often add information about their blood pressure (36/49, 73.5%), cholesterol (22/49, 44.9%), and waist circumference (15/49, 30.6%). Additionally, 22.4% (22/49) of the participants had not filled in information about diabetes in STAR, while diet, stress, mental resources, relationship, and family were missing each from one participant (2%, 1/49).

Health challenges identified by the nurse that could not be categorized
The 32 health challenges named by the nurse that could not be classified into the 17 categories of the STAR report were not identified by STAR. Musculoskeletal diseases were the most common of them. The nurses have named musculoskeletal diseases 9 times among the health challenges, but STAR was unable to identify them. In addition, STAR does not classify work ability into three different color-coded categories if the participant has responded that he/she is not employed. However, the nurses mentioned work ability as a health challenge in 48.9% (23/47) of the participants, which caused a discrepancy (Figure 1). There were also some specific diseases and symptoms that STAR could not recognize, e.g. migraine, COPD, fibromyalgia and impaired hearing. Nurses had also mentioned various psychosocial problems among the health challenges, for example autism and fear of social situations, which STAR was unable to identify. There was also some lab values, problems in taking care of the participant's own health, and diseases that run in the family, which the nurses had mentioned, but STAR was unable to identify.

Discussion

Principal results
STAR recognized the health challenges named by the nurse well if the particular health challenge was covered in the questions of STAR. In half of the cases, STAR identified all the health challenges identified by the nurses. Alcohol consumption, smoking issues and elevated cholesterol levels in particular were recognized similarly. On the other hand, the existence of certain health challenges was often left unassessed by STAR due to a lack of input from the patients. The participants most often lacked information about their blood pressure, cholesterol, and waist circumference. Furthermore, musculoskeletal diseases were not covered in STAR questions and not recognized as health challenges in the STAR report, but they were listed among the top-three health challenges by the nurses. On the other hand, STAR sensitively named diet and community action among the health challenges.

The life expectancies of the unemployed in this study group (average 78.1 years, SD 6.8) did not differ substantially from the national average life expectancy at birth [44]. However, the life expectancies of the participants in the STAR reports were probably overestimates, as many

participants lacked information on essential risk factors to be taken into account in estimations of their life expectancy. Above all, the majority lacked information on blood pressure. High blood pressure is known to be a significant factor in reduced life expectancy [45].

Comparison with prior work

Evidence on the impacts of online health checks is limited. Especially, there is no previous research on comparisons between online health check and nurse led heath examinations. However, in a feasibility study in England, it was found that online health check for reducing alcohol intake among employees appeared feasible and acceptable, but the study included low participation rates, potentially attracting 'worried well' employees rather than those at greatest health risk [46]. Our study complements the perception that hazardous alcohol use can be identified well with online health check and our study increases the knowledge of the uniformity of the assessments of online health check and nurse examination regarding the identification of alcohol use.

Furthermore, a scoping review of the usability and utility of eHealth for physical activity counseling in primary health care centers found technical problems and the complexity of programs to be notable usability barriers to eHealth [48]. In our study, the unemployed participants' ignorance of their health-related parameters such as blood pressure, cholesterol, and waist circumference, among other things, had a significant impact on STAR's recommendations.

Strengths and limitations

The strength of the study was the prospective design in a real-life setting focusing on potential high-risk people that could potentially benefit from the health check, and there is little previous research in regard to targeted screening amongst this particular group. In addition, as a reference for the online health checks, we had the nurses' assessments of the top-three health challenges for the same participants.

The limitation of the study was the small number of participants, which may have had an impact on the results. It was slow to gather study material due to the tight schedules in the participating health centers. There was a shortage of nurses during the COVID-19 pandemic, which slowed down the data collection. Furthermore, in many cases motivating the unemployed to participate in this study was difficult, possibly due to their individual and complex situations and their low interest in digital applications. In addition, many of the participants did not show up for the health examination. However, sample size was sufficient for statistics concerning moderate or higher level of agreement between two measures.

The nurses were requested to name only the top-three health challenges; hence an exact comparison of the health challenges between the nurses and STAR was not possible. Furthermore, deviating from the instructions, some nurses named more than three health challenges per participant but this did not have an impact on agreement analyses. In addition, the use of a digital tool as an intervention may have had an impact on the participants' thoughts about their health before the nurse's visit. Furthermore, there is a risk of selection bias because people who are comfortable with digital tools will probably more readily agree to participate compared with those who are not familiar with such technology. People who struggle with computers and technology may have refused to participate, even though they could provide important information concerning usability and the user experience. It has been reported that the users of eHealth interventions are more likely to be highly educated and have a healthier lifestyle than average, while those who could benefit the most are not using them [49, 50].

The health challenges named by the nurses may have differed from those in the STAR report due to differences in terminology. In addition, interpretation of the open-answered terms was challenging. It proved difficult to classify the health challenges named by the nurses and STAR as being exactly correspondent.

Implications

STAR recognized quite well the health challenges named by the nurses but missed some essential ones. This reflects the focus of STAR on cardiovascular risk factors, which seem to cover the health and wellbeing concerns of the unemployed only partially. In Finland, for instance, the greatest health challenges related to the subjective inability to work are musculoskeletal and mental disorders [51]. The nurses often named musculoskeletal complaints as health challenges, but STAR was unable to identify them. In the future, STAR could be developed to identify health challenges related to musculoskeletal health as well due to their commonness and impact on health and disability [52]. Furthermore, participants did not remember or did not have information on crucial cardiovascular risk factors (e.g., blood pressure, cholesterol values, waist circumference), which had an impact on risk assessments. It is obvious that STAR would better identify health challenges if the participants had answered all the questions in STAR and known all the values needed in the answers. In this case, the report would have been also more plausible and reliable for the participant. Before filling out the STAR health check, the important values should be reminded to the user. In addition, the focus of the nurse's health check differs from the online health check to some extent. STAR is focused on assessing cardiovascular risk and mental well-being, hence a more comprehensive health-related assessment may have been missed in the online health check. STAR did not identify specific diseases or symptoms, such as migraine, COPD, impaired hearing etc. because STAR is instead specially designed to identify risks factors associated with lifestyle, substance use, cardiovascular health and mental well-being and impact of various parametres (e.g. blood pressure and cholesterol) on health and risk of illness.

STAR identifieds significantly more health challenges (an average of 7.4 health challenges per participant) than the nurse was asked to name. The large number of health challenges named by STAR may be unmotivating from the participant's point of view. Although STAR prioritizes health challenges by classifying them into red and yellow, STAR could provide a more precise prioritization to enable the user to know which of the health challenges would be the most important to fix. This could also help nurses to assess which health challenge is the most significant for the patient.

According to our results, STAR may be used as a screening tool before the nurse's face-to-face health checks with the unemployed. Our study does not give answers to the question of who needs a face-to-face health check in this group. However, it seems evident that a nurse's health check covers more various aspects, especially in complex cases. Face-to-face encounters and interaction may facilitate the discussion of patient-centered health issues, which may be missed in digital screening. However, an online health check could help to identify in a structured manner the most relevant health issues and identify the patients whose needs are the greatest. This is in line with Nordic general practice core values and principles [53]. Our results reveal that an effort should be put into providing support for self-measuring health indicators essential for online health checks.

Conclusions

In conclusion, STAR identified most of the health challenges identified by the nurses but missed some essential ones. STAR is focused on assessing the risks of cardiovascular diseases and mental well-being, and some other aspects of health were missed. Users did not have information on crucial risk factors (e.g., blood pressure and cholesterol values), which are pivotal in assessing cardiovascular risks. Using the tool for screening or as a part of a traditional health check with

necessary measurements and dialog with health care professionals may improve the risk assessments and streamline health checks of the unemployed.

Acknowledgements
We would like to thank Antti Virta from Duodecim, who assisted with STAR, and helped to determine the study setting, the study objectives. We are also grateful to Osmo Saarelma, who helped to get started with this idea, student Henna Kuhlberg, who arranged the protocol and finally student Onni Koskela, who helped in data collection. We also would like to thank the nurses who performed health checks at the health check-up units of the unemployed in Tampere and Espoo health centers. We also thank Samuli Känsälä, who helped in data collection in Espoo.

Funding Statement
This study was supported by the Strategic Research Council at the Academy of Finland under grant numbers 352501 and 352503, Nordforsk under grant number 100477, and by the Competitive State Research Financing of the Expert Responsibility area of Tampere University Hospital by the projects 9AA031 and 9AC037

Data Availability
The datasets generated and analyzed during the current study are not publicly available due to limitations of ethical approval and privacy policy, but they are available from the corresponding author upon reasonable request.

Conflict of Interest
Tuomas Koskela worked as a salaried part-time editor for Duodecim Medical publications until 2018.
The other authors declare that they do have no competing interests.

Authors' Contributions
TK, IH and SK have designed this study. VR performed the data collection in Tampere, VR and RA performed the statistical analyses, and VR has been the major contributor of the manuscript. Samuli Känsälä and KS performed the data collection in Espoo. VR, TK, SK, IH and KS and have contributed to the interpretation of the data, supervised and critically commented the manuscript. All authors have read and approved the manuscript.

Abbreviations
STAR: STAR Duodecim Health Check and Coaching Program

Multimedia Appendix 1
The questionnaires used in the study.
[DOCX File , 16 KB-Multimedia Appendix 1]

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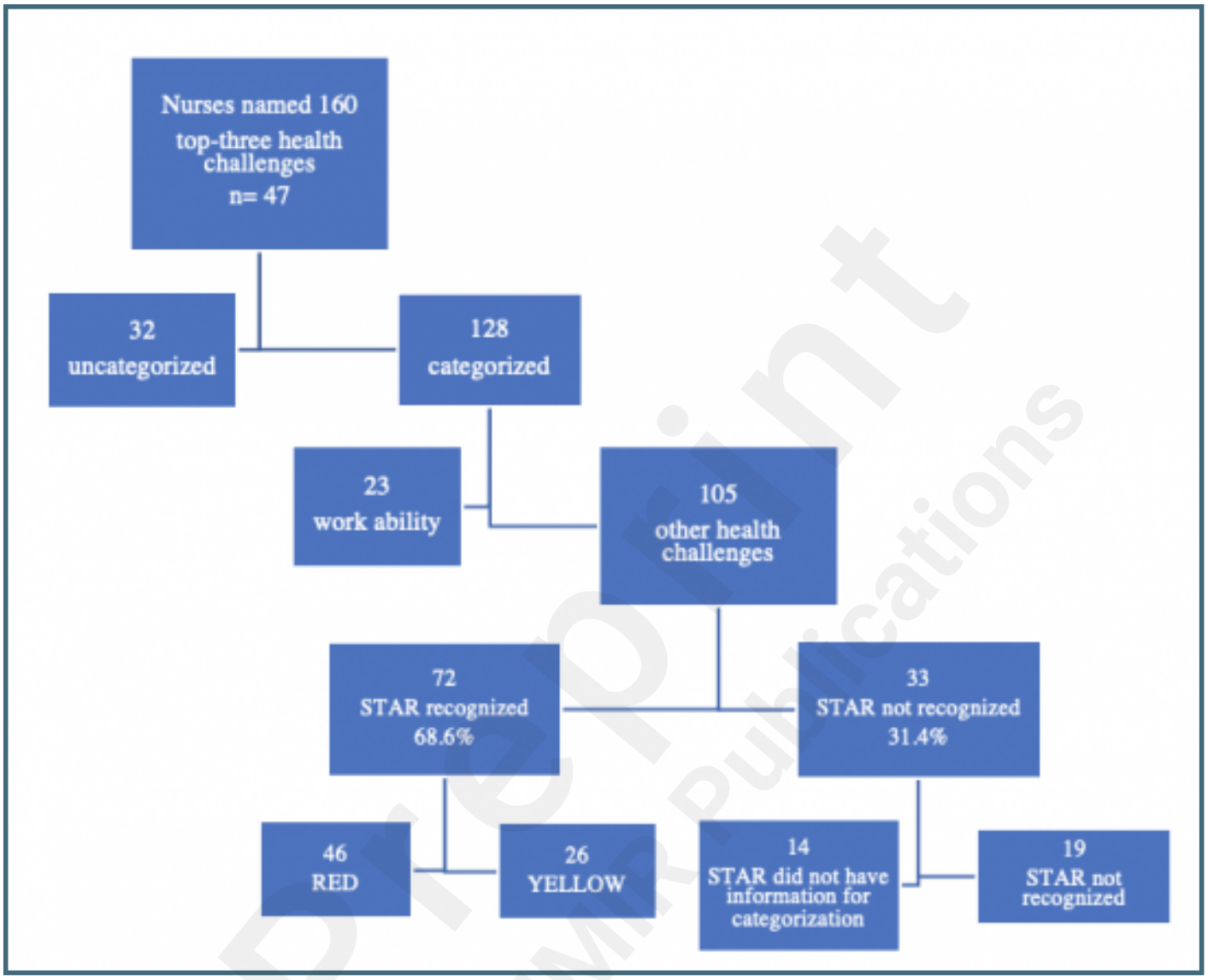
Supplementary Files

Tracked version, changes highlighted.
URL: http://asset.jmir.pub/assets/45103c02a70f2389f5b966bae82ca4f1.docx

Figures

Flowchart of the different health challenges identified by the nurses and the online health check (STAR) in the study.



Multimedia Appendixes

The questionnaires used in the study.
URL: http://asset.jmir.pub/assets/7b0d2e6023075e7dea79fa28e4a610a4.docx