MULTIFACETED INVESTIGATION OF CARDIOVASCULAR RISK PERCEPTION FROM A HEALTH PSYCHOLOGICAL PERSPECTIVE IN A HUNGARIAN COMMUNITY SAMPLE: THE BUDAKALÁSZ EPIDEMIOLOGY STUDY

PhD thesis

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1. Introduction

Cardiovascular diseases (CVD) represent a significant burden worldwide on economies, healthcare, and quality of life. According to the European Society of Cardiology (ESC), 11 million new cases have been registered worldwide, resulting in 3.9 million deaths yearly. The behavioural manifestations of these influences are significantly affected by various clinical and subclinical psychological factors, such as self-esteem, a sensation-seeking personality (i.e. risk-seeking characteristic) and, through them, self-care abilities, chemical and behavioural dependencies, and coping strategies. Over the past decades, numerous research groups have investigated these aspects, providing substantial literature on the direct and indirect effects of psychological states affecting health behaviours. We can better understand disease-related decision-making using health psychology models, and effective preventive interventions can be planned based on these.

Several protective and harmful factors directly or indirectly affect the onset and outcome of CVD.

2. Objectives

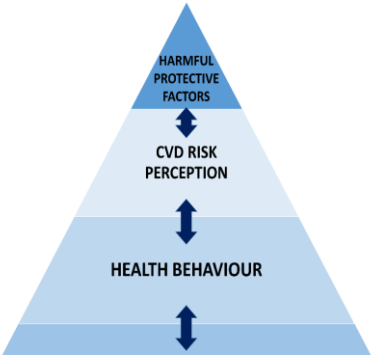


Figure 1. Schematic representation of the conceptual framework

This dissertation aims to explore, on one hand, the protective and harmful psychosocial factors contributing to cardiovascular risk perception and awareness as well as health behaviour, and on the other hand, to explore the different types of cardiovascular risk perception and the effect of

cardiovascular risk communication to the change of health behavior.

3. Methods

3.1. Sample and Procedure

The study is a longitudinal, three-step research conducted with mixed methods (cross-sectional and longitudinal). It is based on the BES conducted between 2012 and 2014 (102). The BES was a comprehensive, voluntary participation-based cardiovascular screening program targeting the adult population of Budakalász, which included a health questionnaire, non-invasive measurements (anthropometry, echocardiogram, carotid artery ultrasound, blood pressure, ankle-brachial index), as well as venous blood sampling and laboratory tests. By January 2014, 2420 individuals (30% of the population, 41.2% male, average age 54.8 years) were examined, and their cardiovascular risk was assessed using the Framingham risk scoring system. The result was communicated in written feedback (Step 1).

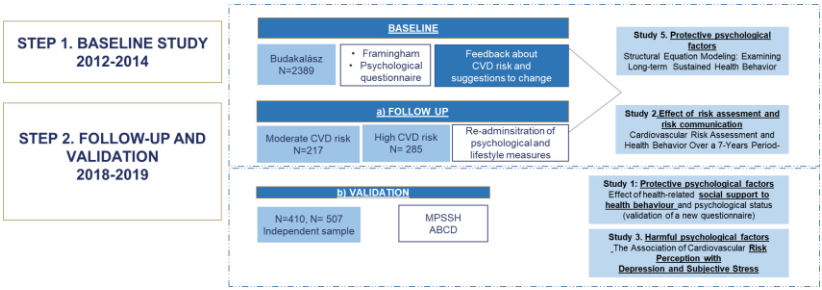


Figure 2. Step 1. of the research process

In 2019, as a follow-up to the BES conducted between 2012 and 2014, a questionnaire survey (n = 502) was carried out within the framework of the National Heart Program (Step 2/a). In 2018, a study was conducted to validate a new psychological

questionnaire for social support in the health domain (MPSSH) (Step 2/b.). Step 1. and Step 2. are represented in Figure 3.

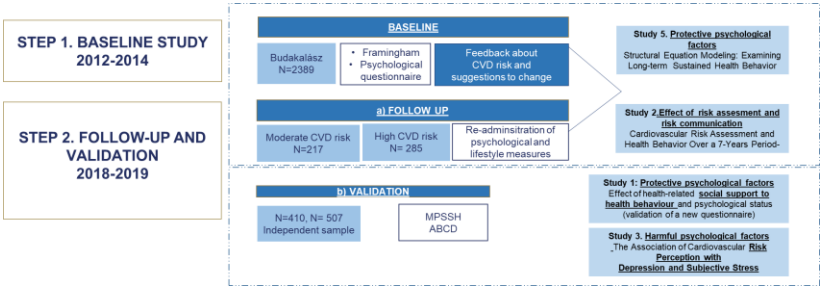


Figure 3. Step 2. of the research process

The Expanded Budakalász Study 2023-2024 (EBS) involved following up on the BES and expanding the study sample with two additional populations (residents of the 9th district and employees of Semmelweis University) (Step 3., see Figure 4).

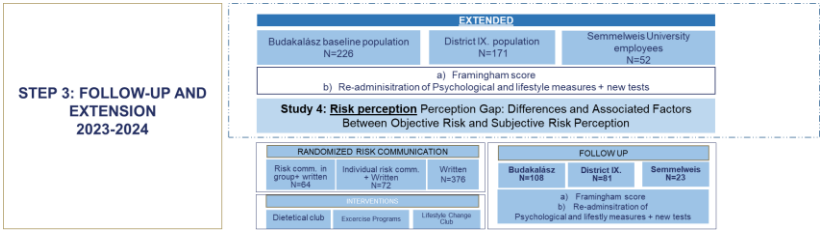


Figure 4. Step 3. of the research process

3.1. Measures

Medical Measures

Framingham Risk Score (FRS): Participants were categorised into three risk groups: low-risk (<10%), middle-risk (10–20%), and high-risk (>20%).

Laboratory Examination: During the blood tests, samples were analysed for blood lipids, including TC, LDL, HDL,

triglycerides, glucose, and Haemoglobin A1c (HbA1c). In the absence of an LDL determination, a calculated LDL value was used.

Blood Pressure*:* The results of three consecutive measurements were recorded, and their average values were used for the analyses.

Body Composition Measurement*:* Body composition measurements were taken during all subsequent examinations, except for the basic examination, within 20-25 minutes after arrival. The InBody 270 device was used for the measurement. The following outcome data were recorded in the database: InBody score, lean body mass, muscle mass, body fat mass, visceral fat level, risk of obesity (%), and BMI.

Psychological Measures

Hungarian Center of Social Sciences (HCSS) Questionnaire*:* The HCSS questionnaire is a 128-item measurement tool based on the questionnaire used by the Central Statistical Office during the EHIS.

Short Form Health Survey (SF-36) shortened version*:* The Short Form Health Survey is a 36-item, patient-reported survey of patient health.

World Health Organization (WHO) Well-Being Scale (WHO-WB)*:* The 5-item shortened WHO Well-Being Scale is one of the most frequently used self-report instruments to measure subjective mental well-being.

Perceived stress (PSS10)*:* PSS10 is a ten-item questionnaire which captures how individuals perceive stress. Respondents rated the statements on a 5-point Likert scale.

Beck Depression- Short form (BDI-9)*:* The shortened and validated version of the Beck's Depression Inventory consists of 9 items. This scale identifies depressive symptoms and their severity and is widely used in research.

Multidimensional Perceived Social Support Scale for Health (MPSSH)*:* The original MPSS is a brief, self-report, self-administered questionnaire and have been further developed and validated by Ocsovszky et al. to measure health-related social support.

Attitudes and Beliefs of Cardiovascular Disease (ABCD)*:* The ABCD Risk Questionnaire has 18 items. Eight items measure CVD risk perceptions, seven relate to perceived benefits of healthy lifestyles, and three assess healthy eating intentions. Our research group validated and adapted this measure to Hungarian language.

Direct Memory Recall (DMR): We administered a short questionnaire to assess how participants remembered their cardiovascular risk after completing their CVD assessment during the BES 2012-14.

Self-Rated Health (SRH): Subjective Health Status: A single question developed and approved by WHO measured the respondent's evaluation of their own health.

Subjective Risk Perception of Cardiovascular Diseases (SRPcvd)*:* A single question about subjective CVD-related risk routinely used in CVD-related studies. (What do you think the risk of you getting any kind of CVD within the next 10 years is?).

Satisfaction with Life Scale (SWLS)*:* A single-item questionnaire was used. Respondents provided ratings on a 10-point Likert scale, with higher scores indicating greater satisfaction.

Health Awareness Index (HAI)*:* HAI was developed in our previous research to measure overall health behaviour.

4. Results

4.1 Study 1: <u>Protective psychological factors:</u> Health behaviours and social support as important factors from a cardio-protective perspective

Regarding the subjective perception of social support, support from family and friends is the most important. However, to a non-significant degree, age weakly and negatively correlates, indicating that the perceived support somewhat decreases with age. The same negative trend is observed concerning depression and perceived stress: the higher the score achieved, the lower the level of perceived support. However, intensive physical activity ($\rho = 0.097$, $p < 0.05$), SRH ($\rho = 0.270$, $p < 0.001$), and well-being ($r = 0.322$, $p < 0.001$) show positive associations (stronger with support from friends), meaning that respondents report more physical activity when perceiving higher levels of support. There is no significant difference in the level of social support regarding gender and educational attainment; in terms of social status, those living with family report higher support from both family ($t = –3.87$, $p < 0.001$) and other individuals ($t = –2.72$, $p < 0.01$). The social support of smokers does not significantly differ from that of non-smokers (See Table1: Correlations between different types of health-related social support and socio-demographic, health characteristics, and mental health indicators).

Table 1. Correlations between different types of health-related social support and socio-demographic, health characteristics, and mental health indicators

	MPSSH		
Correlations	family	friends	others
MPSSH family			
MPSSH friend	0,591***		
MPSSH others	0,816***	0,670***	
Age	-0.005	-0.023	-0.047
SRH	0,244***	0,272***	0,218***
Intensive physical activity	0,135**	0,097*	0.084

BDI-9	-0,343***	-0,316**	-0,297***
PSS10	-0,347***	-0,306***	-0,303***
WHO-WB	0,372***	0,322***	0,311***
Group comparision			
men m (SD)	4,39 (0,86)	3,96 (0,99)	4,42 (0,75)
women m (SD)	4,24 (0,91)	4,05 (0,99)	4,33 (0,83)
t	1.69	-0.88	1.12
basic level m (SD)	4,45 (0,79)	4,05 (0,96)	4,44 (0,75)
intermediate level m (SD)	4,20 (0,93)	4,02 (1,00)	4,31 (0,77)
upper m (SD)	4,28 (0,90)	4,03 (1,00)	4,36 (0,84)
F	2.07	0.02	0.67
single m (SD)	4,04 (1)	3,93 (1)	4,2 (0,89)
married/lives in family m (SD)	4,38 (0,83)	4,06 (0,99)	4,42 (0,77)
t	-3,87**	-1.34	-2,72**
not smoking m (SD)	4,31 (0,87)	4,02 (0,98)	4,38 (0,78)
smoking m (SD)	4,23 (0,95)	4,05 (1,02)	4,29 (0,89)
t	0.91	-0.3	1.15

Abbreviation: MPSSH: Multidimensional Perceived Social Support Scale for Health. ; SRH= Self-Rated Health; BDI-9: Beck Depression Inventory- Short; PSS10= Perceived Subjective Stress; WHO-WB: WHO Well-Being Scale; For SRH and intensive physical activity, Spearman's rho was used, while other correlation coefficients were calculated using Pearson's r.
$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; for unmarked statistical values, $p > 0.05$.

4.2 Study 2: Risk assessment and risk communication: Cardiovascular Risk Assessment and Health Behavior Over a 7-Year Period

The association between recalling the results received seven years ago and changes in health behavior

The analysis produced a Chi-Square statistic (χ^2) of 509.807, with 8 degrees of freedom. The corresponding p-value was <0.001. Individuals who could recall their examination results took action at a higher ratio regarding lifestyle changes to improve their cardiovascular health. Furthermore, an effect size was calculated using Cramer's V, resulting in a value of 0.7. This effect size is statistically significant and indicates a high magnitude of association.

Table 2. Crosstabulation: Frequency distribution table

		DMR Q2			Total
		NA	Action	No action	
DMR Q1	NA	22	-	-	22
	I don't remember at all	79	-	-	79
	Somewhat remember		**49**	70	119
	I remember more or less		**90**	107	197
	I remember exactly		**50**	34	84
Total		101	189	211	501

Abbreviation: DMR: Direct Memory Recall Q1): How well do you remember the level of cardiovascular risk that was reported to you?
DMR Q2: Please recall whether you took any action in response to the feedback regarding your cardiovascular risks! (Action/No action)

Table 3. Table Chi square test and effect size

	action	χ 2	φc
remember	189	509.807	0.713

χ2: Chi square test, φc: Cramer-V effect size (0.60-0.80 very strong)

4.3 Study 3: Harmful psychological states: The Association of Cardiovascular Risk Perception with Depression and Subjective Stress

Convergent and divergent validity with bivariate correlations

The bivariate correlations were predominantly significant and ranged from low to medium. Specifically, higher risk perception was linked to lower self-rated health and well-being, as well as a greater prevalence of depressive symptoms and perceived stress. Conversely, a contrasting relationship was observed for the Perceived Benefits and Healthy Eating Intentions subscales, although the association strength was generally lower for the latter. Knowledge scores did not correlate significantly with any of the examined characteristics. The patterns of associations presented suggest that the cardiovascular disease-related perceptions, as measured by the ABCD Risk Questionnaire, represent distinct constructs that can be differentiated from mental health indices despite demonstrating some relational connections. See Table 4. Bivariate associations of the subscales).

Table 4: Bivariate associations of the subscales

	ABCD Risk Questionnaire			
	Risk	*Benefits*	*Eating*	*Knowledge*
ABDC Benefits	-0.125***			
ABCD Eating	-0.070	0.336***		
ABCD Knowledge	0.053	0.224***	0.143**	
Age	0.011	-0.042	0.014	-0.073
SRH	-0.451***	0.204***	0.059	0.049
Intense physical Activity	-0.103*	0.204***	0.147***	-0.046
BDI-9	0.409***	-0.219***	-0.129**	-0.085
PSS-10	0.317***	-0.207***	-0.131***	-0.066
WHO-WB	-0.365***	0.228***	0.195***	0.027

**P<0.05, **P<0.01, ***P<0.001*
Abbreviatons: ABCD: Attitudes and Beliefs About Cardiovascular Disease; BDI-9: Beck Depression Inventory-Short, SRH: Self-rated Health; WHO-WB: WHO Well-Being Scale

4.4. Study 4: Risk perception: Perception Gap: Differences and Associated Factors Between Objective Risk and Subjective Risk Perception

Associations with Cardiovascular Risk Assessment Inaccuracy

The differences among the "realistic," "optimistic," and "pessimistic" groups in relation to demographic, medical, and psychological characteristics were analysed using the Kruskal-Wallis test.

The most important results are:

Depression: Significant differences between the groups were identified regarding depression ($\chi 2=14.913$, $p=0.001$). Post hoc

analysis revealed that the "pessimistic" group had significantly higher depression scores than the "realistic" (4.80±4.09 and 3.37±3.21 respectively, p=0.006) and "optimistic" (3.26±4.06 p=0.003) groups.

Perceived stress: Significant differences were found across the groups regarding perceived stress ($\chi 2$=10.699, p=0.005). The post hoc analysis indicated the "pessimistic" group to be more stressful compared to the "realistic" group (5.13±2.41 and 4.43±2.72 respectively, p=0.007), although no significant difference was revealed with the "optimistic" group.

Alcohol consumption – frequency: Significant differences between the groups were revealed ($\chi 2$=10.041, p=0.007). According to the post hoc analysis, the “optimistic” group showed significantly worse results regarding the frequency of alcohol consumption in the last 12 months compared to the “realistic” and “pessimistic” groups (3.26±1.52, 2.70±1.19, and 2.59±1.19, respectively, p=0.046 and p=0.005).

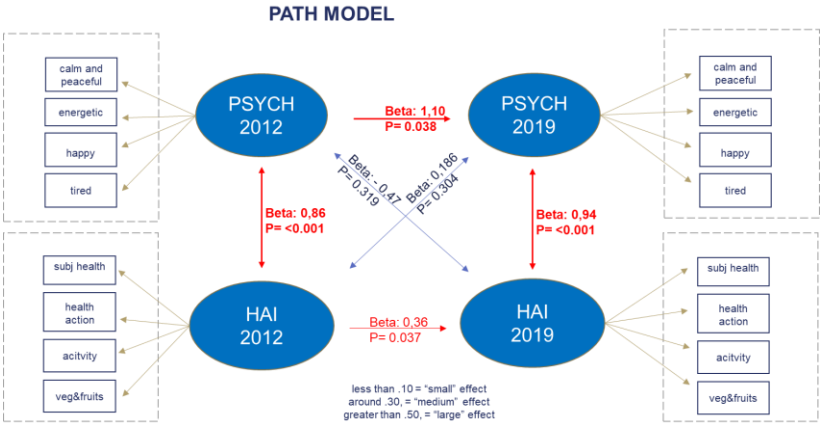
Alcohol consumption-amount consumed: Significant differences were found across the groups ($\chi 2$=11.165, p=0.0004). According to the post hoc test, the “optimistic” group consumed significantly more units of alcoholic beverages during one occasion compared to the “realistic” and “pessimistic” groups (.62±.96, .29±.65, and .25±.56 respectively, p=.013 and p=0.004). See Table 5.

Table 5. Results of Kruskal-Wallis test between realistic, optimistic and pessimistic groups

		Mean rank				
Variable	N	Realist	Pessimist	Optimist	H-stat	P-value
Alcohol c. (12 M)	375	185.72	175.5	222.65	10.041	0.007
≥ 6 alc. un./ event	364	178.2	174.31	211.17	11.165	0.004
BDI-9	336	155.6	192.01	143.85	14.913	0.001
PSS-10	376	171.99	209.39	174.14	10.699	0.005

4.5. Study 5: Protective psychological factors and health behavior: Structural Equation Modelling: Examining Long-term Sustained Health Behavior

We tested the predictive associations between the psychological and health awareness constructs from 2012 to 2019 in a cross-lagged panel model. Based on the significance values, it can be concluded that the latent factor of HAI in 2012 directly predicts the HAI in 2019 (beta = 1.10, p=0.038), and the Psychological Measure 2012 directly predicts the Psychological Measure 2019 (beta=0.36, p=0.037). The cross-lagged predictions did not reach significance (Figure 5: Path Model with beta and p values).



Abbrev.: Psych 2012/2019: Psychological latent factor and the variables belong to it

Figure 5: Path Model

5. Conclusions

This doctoral research aimed to explore the protective and harmful psychosocial factors contributing to cardiovascular risk perception and health behaviour change.

Summary of key findings: #1 Health-related social support, perceived especially from friends, positively correlates with intense exercise activity. #2 Even one well-organised written CVD risk communication might trigger a change in cardio-protective health behaviour, thus decreasing CVD risk. #3 Higher CVD risk perception was linked to lower self-rated health and well-being, as well as a greater prevalence of depressive symptoms and perceived stress. #4 CVD perception, similar to other illnesses, is biased. Our research could reveal that men are more "optimistic" in their cardiovascular risk assessment despite having the highest blood pressure, BMI and lifestyle factors such as smoking and alcohol consumption. #5 With a SEM model, our research brought limited but promising results. Health Awareness Index 2012 influenced the Health Awareness Index 2019. Psychological well-being in 2012 has an impact on psychological well-being in 2019. Health awareness and self-direction, together with increased internal control, can enhance psychological well-being, which helps to maintain healthy attitudes and behaviours.

Significance

So far, to the best of our knowledge, no multifaceted insight into the Hungarian population has been conducted regarding cardiovascular risk, and no longitudinal research on cardio-protective health behaviour has been conducted. Identifying

biased cardiovascular risk perception has significant social (e.g. equitable health, stigma reduction, empowerment) and practical implications, mainly in risk communication and the design of prevention or intervention programs (e.g. personalised healthcare, improved screening programs.

Recommendation for future research

For the better clinical utilisation of our results, our final goal is to develop a screening package that is easy to use in general practice and clinical settings to identify the patient's harmful factors, and suggestions for short, minimal interventions to correct CVD risk perception. Further research may deepen the knowledge on the Hungarian population regarding the possibilities of CVD risk reduction by further studying the trigger points of health behaviour change.

6. Bibliography of the candidate's publications

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IF= 7.002

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