Kotyśko Martyna, Izdebski Pawel, Buczkowski Krzysztof. Distressed personality (Type D) - its role in health and sport - report from research review. Journal of Health Sciences. 2014;4(13):172-186. ISSN 1429-9623 / 2300-665X.
http://journal.rsw.edu.pl/index.php/JHS/article/view/2014%3B4%2813%29%3A172-186
http://ojs.ukw.edu.pl/index.php/johs/article/view/2014%3B4%2813%29%3A172-186
https://pbn.nauka.gov.pl/works/515486
http://dx.doi.org/10.5281/zenodo.13687
DOI: 10.5281/zenodo.13687

The former journal has had 5 points in Ministry of Science and Higher Education of Poland parametric evaluation. Part B item 1107. (17.12.2013).
© The Author (s) 2014;
This article is published with open access at Licensee Open Journal Systems of Radom University in Radom, Poland
Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non Commercial License (http://creativecommons.org/licenses/by-nc/3.0/) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.
Conflict of interest: None declared. Received: 1.12.2014. Revised: 12.12.2014. Accepted: 29.12.2014.

DISTRESSED PERSONALITY (TYPE D) - ITS ROLE IN HEALTH AND SPORT - REPORT FROM RESEARCH REVIEW

Martyna Kotyśko [1], Paweł Izdebski [1], Krzysztof Buczkowski [2]

[1] Faculty of Pedagogy and Psychology, Institute of Psychology, Kazimierz Wielki University, Bydgoszcz, Poland
[2] Faculty of Medicine, Department of Family Medicine, - Nicolaus Copernicus University in Toruń - Ludwik Rydygier Collegium Medicum in Bydgoszcz, Bydgoszcz, Poland

Abstract

Introduction: Type D personality or distressed personality is a construct provided by Johan Denollet. It refers to people who: a) generally experience negative emotions and their affect is dominated by them; b) restrict themselves from self-expression in social situations. Type D is mainly studied as a predictor of somatic diseases, especially in cardiology.
Aim (Objective): The article reviews scientific papers including Type D in relation to health and sport from 3 databases to present the state of the art in this area.
Materials and methods: Three scientific databases were searched (PsycARTICLES, ACADEMIC SEARCH COMPLETE and MEDLINE). Key words putted in databases searching engines were: "distressed personality" OR "type d" AND "health"; "distressed personality" OR "type d" AND "sport". The main inclusion criterion for a research was its subject - related to Type D.
Results: Seventy eight research were included into extended analysis. Forty eight studies were conducted on unhealthy subjects (mainly on cardiac patients but also on cancer survivors, irritable bowel syndrome patients, patients with diabetes). The results of those research generally confirm the relation between Type D personality and poorer somatic and mental health. Only one research was indirectly related to sport. But there were no single research specifically on people who do sports (professionally or are in the training stage of their carrier).
Conclusion: There are many studies on distressed personality, but there is a lack of research conducted on athletes. Such research might be useful in creating programs for athletes who have difficulties in coping with stress.

Key words: distressed personality, type D, psychology, health, sport.

Introduction

In 1995 Johan Denollet introduced the concept of distressed personality, called in short - Type D. It consists of two main dimensions, i.e. negative affectivity and social inhibition - both of them are regarded as a relatively stable personality traits. First dimension is defined as follows: "negative affectivity is a basic personality trait that refers to the tendency to experience negative emotions across time and situations" [Watson, Pennebaker, 1989; in: 1:348]. The definition of the second dimension is similar: "social inhibition is a basic personality trait that refers to the tendency to inhibit the expression of emotions and behaviors in social interaction" [Asendorpf, 1993; in: 1:349]. When we talk about negative emotions related to those two dimensions, we mean fear, anger, irritability or hostility. People with Type D personality consciously refrain from disclosing emotions, especially in social situations, mostly out of fear of disapproval and rejection from others [1-2]. Type D construct was developed on the basis of observations and tests on cardiac patients - as a way of a possible explanation of a disease cause and as a risk factor in disease progression. Description of cardiac patients who are Type D includes: "symptoms of anxiety, depression, and psychological stress, and these symptoms are accompanied by the relative absence of positive emotions. These patients may be lacking in self-esteem, are less satisfied with life in general, and tend to report low levels of subjective well-being" [1:350]. Among non-clinic groups, Type D individuals have "a tendency to worry and feel stressed, low (or lack of) sense of security, pessimistic outlook on life, feeling unhappy, poor tendency to share emotions with others mainly due to the fear of being disapproved of and rejected, sense of discomfort in the presence of other people, mainly strangers, weak bonds with other people and a tendency to blame oneself" [Ogińska-Bulik, 2009, in: 3:382].

Ogińska-Bulik [4:30] proposed theoretical relation between Type D and health. Her model includes three components: cognitive, affective and behavioral. In this relation dimensions of Type D - negative affectivity and social inhibition, affect ways of coping with stress and how an individual cognitively assesses everyday life situations. Negative affectivity influences process of assessment of situation. Type D person interprets events generally in negative way (cognitive component) - as threatening and harmful. Such an interpretation is a cause of intensification of experiencing negative emotions (affective component). As a result, person should find a way to cope with these emotions, but in case of Type D individuals, their coping focuses on inhibition of expression negative emotions (behavioral component), which leads to intensification of stress. In consequence, the changes occur in autonomic nervous system, as well as in functioning of somatic system, which might lead to the disease.

It is worth mention that a tool to measure Type D evolved from 16-item scale [5] through 24-item scale [6] finally to 14-item scale [2]. A person who is called a Type D, has a high score on both dimensions of the scale - negative affectivity (NA) and social inhibition (SI). It means that those people at the same time experience negative emotions and do not show it - they inhibit themselves from expressing it [7].

Type D was analyzed in light of Fife-Factor Model (FFM) of personality - one of the most popular one and one of the best empirically tested in psychology, treated as a culturally independent. Denollet and De Fruyt [8] verified if Type D dimensions: negative affectivity (NA) and social inhibition (SI) were related to five factors of personality. The most important significant correlations were noted between NA and Neuroticism (0,74) and between SI and Neuroticism (0,50) and Extraversion (-0,61). These results confirmed that Type D and its two dimensions might be described by basic factors of personality. This research also showed that the variance of NA and SI can be explained (based on results of regression analysis) almost in 50% by FFM dimensions, mainly by Neuroticism and Extraversion.

Above we presented information about Type D and its relation to health. It was also showed that Type D is rightfully described as a type of personality because of its roots in FFM. The influence of distressed personality was generally measured among cardiac patients and healthy people. We suppose that Type D might be an important factor in functioning of athletes. This assumption was the basis for a research review on Type D, health and sport.

Aim

The objective of this paper was to prepare a scientific research review, including the relation between Type D and health and Type D and sport, to present the state of the art in this area. Such knowledge will facilitate the discussion on the importance of Type D.

The aim of the study stems from the need to broaden the perspective of reflection on the Type D - its importance among athletes - on new research group. Athletes are influenced by multiple stressors, both as sportsmen and as individuals. Their ways of coping with stress are only one aspect of the research, but it is worth checking whether they have the distressed personality and how it eventually translates into their functioning as athletes.

Materials and methods

Search strategy

On 4th of April 2014 three electronic scientific databases were searched - PsycARTICLES, ACADEMIC SEARCH COMPLETE and MEDLINE. Key words put in databases searching engines were: "distressed personality" OR "type d" AND "health"; "distressed personality" OR "type d" AND "sport". We decided about not using any restrictions with regards of the year of publications.

Inclusion and exclusion criteria

The main inclusion criteria for a paper to be put into analysis were: 1) its subject - related to Type D among healthy people or patients in relation to somatic and psychological health, and sport; 2) a publication was a research study (original article); 3) a publication was in English or had at least an English abstract; 4) a publication should be in full text version.

The articles were excluded when: 1) presented a research review; 2) were a letter to the editor, poster or abstract from the conference; 3) only abstract was available.

Records searched via database

The result of a search of the database was to determine the number of records on the Type D health and sport (specific keywords were used). Number of records in each database was: PsycARTICLES (*N*=19), ACADEMIC SEARCH COMPLETE (*N*=1201) and MEDLINE (*N*=2231). After applying the inclusion and exclusion criteria and removing duplicates, 78 studies were included into extended analysis.

Table 1. Presentation of number of studies in each group of subjects divided into 3 categories: focusing on somatic health, focusing on mental health and research showed as well somatic and mental health issues, general number of studies *N*=78.

	Somatic health	Mental health	Somatic and mental health	Total
Patients	15	27	7	48
Healthy subjects	8	14	7	29

Results

Research conducted on unhealthy subjects (clinical groups): somatic health

As it was mentioned before, almost all research about Type D were conducted on cardiac patients with different cardiological problems. Generally Type D is perceived as a risk factor of health deterioration. Research which focused on somatic aspects of disease and its relation to Type D show that individuals who are described as those with distressed personality (at the basis of DS-14 results or its other versions) have poorer health [3, 9-16].

The first group of unhealthy subjects, which will be described, is cardiac patients. In a longitudinal prospective study Denollet et al. [10] indicated that Type D is a predictor of MI (myocardial infarction) or death. In another long-term research of Pedersen et al. [11], Type D cardiac patient's health status was more impaired than in group of non-Type D patients who participated in the same treatment. Denollet et al. [9] presented that Type D cardiac patients had higher risk, than non-Type D individuals, in experiencing adverse cardiac events. In the group of CHF (chronic heart failure) patients, Type D and inadequate consultation behavior (failure in consultation when symptoms of CHD occurred) were significant predictors and risk factors of impaired health status [12]. Also among CHF patients with Type D, lower level of hemoglobin was revealed, as well as future anemia [14]. In the category of studies on cardiac patients, research on medication adherence is worth mentioning. MI patients, who went into medication treatment and had distressed personality, were less adherent to treatment than individuals without type D. It was suggested that Type D might be an explanation why cardiac patients with such type of personality have worse treatment outcomes [17].

Different results, than those described above, were gained in the study of Damen et al. [18] where Type D was not significant separate predictor of mortality among PCI patients (percutaneous coronary intervention). Along with this report, de Jonge et al. [19] claim that Type D personality among MI patients is less important than depression in relation to somatic health. Volz et al. [20] indicated that Type D was insignificant in prediction of mortality and readmission to hospital in CHF patients.

Studies performed on other patients groups include: OSAS patients (obstructive sleep apnoea syndrome), IBS patients (irritable bowel syndrome) and psoriasis patients.

Broström et al. [21] investigate relationship between sleep problems and distressed personality among patients with OSAS treated with CPAP (continuous positive airway pressure). In this group, Type D individuals perceived more frequently and severe side effects on CPAP usage. They also were less adherent to CPAP treatment than non-Type D patients. Because of sleep deprivation and lower sleep quality, OSAS patients with Type D personality had worse therapy effects.

The issue of sleep problems was analyzed also in the group of IBS patients in relation to Type D. IBS patients with Type D had more sleep problems (sleep latency, sleep disturbance, lower sleep quality) than patients without distressed personality [22].

Basińska and Woźniewicz [3] performed a research on psoriasis patients. A comparison between groups with high and low increase of complaints showed that among patients with higher increase of complaints the level of negative affectivity (NA of DS-14) is greater.

The presentation of research focusing on somatic health in relation to Type D showed that this psychological construct is a significant risk factor, especially among cardiac patients, in health deterioration. It might be also a cause of somatic disease. Next stage of research review is to give a report of relation between Type D and mental health among clinical groups.

Research conducted on unhealthy subjects (clinical groups): mental health

Studies performed on patients do not concentrate only on their somatic health, but also include mental state/health. In this part, research on Type D and psychological or psychiatric variables will be presented.

Many studies focus on relation between Type D (and its subscales NA and SI) and depression and anxiety [6, 23-36]. Generally Type D patients are more depressed and anxious than non-Type D. This relationship might be explained when we analyze it through FFM - Neuroticism (see: de Fruyt and Denollet [8]). Neuroticism as a personality factor describes people at two dimensions: emotional adjustment versus emotional imbalance. Neurotic people tend to experience more negative emotions and to be more stressed. This factor includes 6 components - two of them are: anxiety and depression [37]. Research of de Fruyt and Denollet [8] showed important relation between Type D and Neuroticism - they have similarities, so if Neuroticism includes depressive mood and anxiety - than is a high probability that Type D should be as well connected to them. Studies on different clinical groups: nefrological patients [23, 30], cardiac patients [6, 24-26, 28-29, 31, 34-36, 38], diabetic patients [32], cancer survivors [33], neurological patients (with Parkinson disease and multiple sclerosis) [39], and rheumatoid arthritis patients [40] confirm those assumptions. Among Chinese adolescents with depression, Type D was more frequent than in a control group [41].

One research [42] on acute coronary syndrome (ACS) showed that Type D was not a significant predictor of development of depression, when patients did not have this disorder before.

Mental functioning of patients was analyzed not only in psychiatric matter but also from psychological point of view. There is some evidence that patients who are Type D perceived their disease as more severe [43-45]. They also present negative coping with stress [46-47]. Such variables as life quality [30, 48-50], life satisfaction and well-being [40] were put into consideration in different groups of patients. Type D was analyzed as differential variable or as a correlate. Differences between Type D and non-Type D individuals were noted in group of rheumatoid arthritis patients. Type D' scored lower on scales of life satisfaction and well-being [40]. Health-related quality of life was lower in nefrological Type D patients [30]. Similar results were observed in group of peripheral arterial disease (PAD) Type D patients and their level of life quality [48]. Type D was significantly negatively associated with life quality in Parkinson disease [49] and irritable bowel syndrome patients (negative affectivity) [50]. Analysis of general mental health showed that patients with Type D personality got lower level of mental health than non-Type D [33, 39, 51].

Distressed personality was compiled with level of stress among patients [35-36, 38, 48]. It was confirmed that patients with Type D personality [48] (or with high level on NA [36]) experienced more stress than individuals without Type D personality. This variable was also an important predictor of distress level [38] and was significantly associated with it [35].

A single research [52] on patient group with cardioverter defibrilator implantation showed that 7,6% of patients who participated in this study had PTSD symptoms and might have been diagnosed for it. Among them 55% were Type D. Results showed that distressed personality is a risk factor and a significant predictor of PTSD among this group of cardiac patients.

Research conducted on unhealthy subjects (clinical group - cardiac patients): somatic and mental health

Some studies focus on both areas of functioning - somatic and mental. Seven researches were classified into this category. All of those studies were conducted on cardiac patients with different type of disease.

CHF individuals with Type D, in research of Pelle et al. [53] presented: lower level of impaired mental health status, more cardiac symptoms and feelings of disability. In the same group of patients [54], researchers checked if there had been any changes in their somatic and psychological functioning after 12 months. Differences were noted between Type D and non-Type D patients in lower level of physical and mental health status (and its subdomains). Type D was a significant predictor of impaired physical and mental health status at 12 months.

It was examined if among ACS patients the cortisol awakening response is associated with distressed personality. Gathered data revealed that Type D and depression were predictors of higher level of cortisol response, which might be connected to disruption of HPA axis and in consequence lead to greater cardiac response in this group of patients [55]. Similar results were observed in ischemic heart disease patients, where Type D was associated with depression and higher prevalence of hypertension [56]. In another study [57], CAD patients who were Type D got worse results than control group in: functional status (exercise capacity measured in watts), presented higher level of fatigue (general, physical and mental), lower motivation to activity and higher results in depression and anxiety scales.

The relation of Type D to somatic and mental health was examined in research of Mommersteeg et al. [58] in the group of nonsignificant coronary artery disease. Type D was significantly related to worse disease perception along with lower treatment satisfaction. Lower level of health status - physical and mental, and higher emotional distress - were associated with distressed personality.

The last research, in this category, included patients after heart transplantation [59]. In this study Type D personality was negatively associated with physical and mental health status (as in [58]).

Research conducted on healthy subjects: somatic health

As it was mentioned at the beginning of this paper, we put into extended analysis 29 articles conducted on healthy subjects. We will begin with articles focused on somatic health.

Martin et al. [60] studied if Type D personality, in different ethnic groups, is connected with heart rate variability (HRV). Both parameters - high frequency (HF) and low frequency (LF) were measured. The significant predictors of HF and LF of HRV were: sex, ethnicity and Type D. When it comes to women, their parameters of HRV were healthier than in men - HF was higher and LF was lower in every of three situations, when subjects needed to imagine a stressful and uplifting situation, and when their parameters were measured at the baseline. Type D was an important variable in interaction with ethnicity. European-American Type D individuals presented lower level of HF HRV and higher level of LF HRV than other groups during stressful imaginary situations.

Different cardiological parameters were measured in the study of Howard and Hughes [61]. Authors examined the habituation and sensitization to recurrent stress in groups of females and males, both with and without Type D personality. Their study showed that there are no sex differences in physiological parameters between men and woman, even when a new variable - Type D was added. The main information from this research was to show, that

Type D men responded differently to recurrent stress than men without Type D personality. Their reaction to stress was not a habituation but sensitization. This finding might be a proof of how the somatic pathogenesis of cardiovascular proceeds.

Another research raised an issue of health in the context of sleep disturbances [62]. Participants of this study were adolescents (age of 15-18). There was a significant positive relation between Type D and sleep disturbances. Negative correlation was reported between Type D and sleep hour on school nights. Higher, than in case of Type D, correlation coefficients were noted between negative affectivity (NA) and sleep disturbances, as well as with sleep hour on school nights. Information from this research might explain the pathway of development of sleep disorders but also explain different somatic and mental health problems which have their cause in sleep disturbances in group of Type D adolescents.

Another aspect of health functioning of people with Type D personality was presented in study of Mommersteeg, Kuper and Denollet [63]. In their research it was proved that Type D was present more frequently among individuals with metabolic syndrome. Those people led also an unhealthy lifestyle (had less varied diet, did not restrict fats income and were less physically active), than non Type-D.

Type D was a significant variable in the study of van Bom-Martens et al. [64] which concentrated on relation of Type D and socioeconomic status on health. The results indicate that Type D personality occurred more in groups specified on different criteria e.g.: low education level, low income, poor health and high psychological distress.

On the other hand, there are studies which show that Type D is an insignificant predictor when it comes to somatic health [65-67]. Longitudinal study of Mommersteeg et al. [67] - showed that Type D was not associated with the metabolic syndrome. Non-cardiac group was examined [66] in respect of Type D and cardiovascular functions. None significant correlation was noted between somatic parameters and Type D. Among people who has already retired [65], there was no relation between Type D and risk of CHD.

Research conducted on healthy subjects: mental health

Korean scientists tested adolescents [68] and divided them by being a Type D or not. Results of this research presented some differences between those two groups in (all results were higher in Type D group): depression level, parameters of schizophrenia, mental health problem behavior and alcohol disorder parameters. Two factors of Type D - negative affectivity and social inhibition were significantly related to e.g.: depression, schizophrenia symptoms, psychiatric problems, internalizing problems. In few studies [69-72] it was also confirmed, that depression symptoms were present more often among adult Type D participants.

In a totally different research [73], scientist had compared victims and non-victims of domestic violence. It was examined, in which group, level of loneliness was differentiated by having a Type D personality. Among victims of violence, who were Type D, level of loneliness was higher than in non-Type D individuals. The other group - prison workers, in research of Kunst, Bogaerts and Winkel [74] was interviewed about being a victim of aggression in correctional institutions. The collected data showed that Type D and being exposed to inmate aggression - interaction of these two variables - were predictors of PTSD symptoms. Two studies on soldiers obtained results in which: negative affectivity [75] and Type D personality [76] were significant predictors of PTSD symptoms.

When it comes to stress and distressed personality, it was checked how Type D is related to work [77]. A group of healthcare professionals from Poland has been tested for following parameters: Type D personality, perceived job stress, burnout and general health.

Healthcare professionals who were Type D got higher results than non-Type D in e.g.: general work stress, emotional exhaustion, general health status, depressive symptoms and somatic complaints. Similar results were obtained in research of Polman, Borkoles and Nicholls [78], who tested first year undergraduate students and their reactions to stress. Type D participants got lower level of social support provided by family, higher level of resignation and withdrawal coping, higher level of perceived stress and higher level of exhaustion (the aspect of burnout) than non-Type D.

Type D personality and its role in health-related behavior was analyzed by Williams and associates [79]. They analyzed how many young adults can be labeled as Type D and what is their level of health behaviors, social support and narcissism. Results indicated that Type D individuals presented lower level of health behaviors and lower social support than non-Type D participants.

Only one research from the database analysis was indirectly related to sport. This study [80] included males who were classified as: sedentary, active and weight trainers. Scientists checked the body image in those groups in relation to Type D personality. The highest percentage of Type D participants was among sedentary group. Second one was group of weight trainers and least number of Type D' was among actives. In general analysis, Type D participants got lower scores on body image subscales than non-Type D and were more preoccupied about being overweight and perceived their weight as higher. Men who had Type D personality and were in sedentary group got generally lower scores on body image than their comparatives in active and weight training groups.

Research conducted on healthy subjects: mental and somatic health

There is another category of research which are focused on somatic and mental health at the same time. Howard and Hughes [81] present results of their study in which they validated construct of Type D in general population. They analyzed psychological and physiological parameters. Results of psychological analysis of this study were as follow: Type D factor - negative affectivity - was a significant predictor of depression and perceived stress; negative affectivity and social inhibition were predictors of anxiety. Stepwise regression showed that: Type D was a predictor of cardiac output and Social Inhibition was also a significant predictor of total peripheral resistance. Comparison of results of Type D and non-Type D individuals indicated that: Type D presented higher level of anxiety, depression, perceived stress, lower level of resting cardiac output and higher level of resting total peripheral resistance. In another study [82], similar results were gained when it comes to depression and anxiety among Type D, but additionally participants who were tested had lower level of tryptophan metabolite - kynurenine.

In a study [83] about perfectionism, health and Type D in a group of elderly people, it was showed, that there is a significant relation between Type D and general health level, negative and positive perfectionism (higher correlation between Type D and negative perfectionism). Another research conducted on elderly participants [84] from Japan, showed that Type D individuals were more prone to experience higher stress and reported lower physical health status than non Type D.

Coping with stress and heart rate variability (HRV) was analyzed among students [85] and 35% of the whole group met the criteria for Type D. Results of regression analysis pointed out that moderation between Type D and social supportive coping was a significant predictor of HF HRV results (negative standardized beta coefficient). Type D individuals preferred negative coping - they used more avoidant coping strategies and reported lower use of positive and social supportive coping than non-Type D.

In the experiment performed by Williams, O'Carroll and O'Connor [86] it was tested, how young adults reacted on stress (measured physiologically and psychologically) and if there were differences between Type D and non-Type D. Collected data showed that males who were Type D got higher cardiac output during exhibition to stressor and Type D individuals (men and women as well) reported higher feelings of subjective stress than non-Type D in stress situation.

The frequency of physical (somatic) symptoms, stress (perceived stress and coping) and Type D personality was a subject of concern of Williams and Wingate [87]. Results on DS-14 were positively correlated with: stress, physical symptoms, and avoidant style of coping with stress. Negative correlations were noted between Type D and level of social support, problem and emotional focused coping style.

Discussion

The main aim of this scientific review was to show the state of the art about distressed personality - Type D. We analyzed the studies conducted on clinical and nonclinical groups. The searching procedure included researches about Type D and health, and Type D and sport. Seventy eight studies were a result of mentioned searching - all concerned relation between Type D and health (somatic and mental health). Only one research [80] was indirectly related to sport by its participants - people who exercise regularly and train at the gym (weight trainers). We decided to divide collected data into two main categories: studies on unhealthy subjects (clinical groups) and healthy subjects (nonclinical groups). Each main category contained three subcategories: somatic health, mental health, and somatic and mental health - this action facilitated presentation of research results.

If we take into account clinical groups - cardiac patients dominated. This is not surprising due to the fact that the beginning of the studies on Type D included precisely this group of patients. Generally scientists checked relations between Type D and depression and anxiety [6, 23-36]. It was proved that people who had distressed personality reported higher level of depression and anxiety than patients who were not Type D. Many studies concerned on somatic aspects of Type D patients functioning. Mainly, they confirm that Type D individuals health is worse than non-Type D [3, 9-16]. Some results from research performed on clinical groups [46-47] and healthy subjects [78, 85, 87] indicated that Type D individuals prefer negative coping with stress - this information is in accordance with the assumptions of Type D in general (negative affectivity - one of the Type D factors refers to "tendency to experience negative emotions across time and situations" [Watson, Pennebaker, 1989; in: 1:348]). Type D individuals were more stressed than non Type D [35-36, 38, 48, 58, 77-78, 81, 84, 86-87]. There were a group of studies which focused on relation between Type D and PTSD symptoms [52, 75-76]. Data showed that people who exhibit PTSD symptoms got higher results on Type D measures.

There were also some studies which showed that Type D was an insignificant predictor of somatic health. Those results were gained on healthy subject, which might indicate, that Type D as a psychological construct may not applied in healthy population. Such reports should be a guidance in construction of further studies and be a caution for one-sided interpretation of research results.

We wanted to check, if there were research on Type D in relation to sport. Unfortunately, we have found only one research which was indirectly connected to sport activity [80]. It was surprising that there were no studies conducted on athletes - this group is being exposed to a lot of stressful situations, especially during games. It is worth to prepare a research on athletes who train different disciplines and who are on different stages of carrier. We think that athletes who are Type D would get less achievements than non-Type D

individuals because of their susceptibility to stress, negative emotions and social inhibition. There might be some differences between athletes from team and individual sport disciplines. We think that recognition of Type D among athletes would have practical application because a precise diagnosis is a first step to provide specific long-term interventions to those individuals.

The presented research review allowed to see a wide range of studies on Type D and health. Based on our findings, one can attempt to implement research on the Type D among athletes and see if their way of psychological and somatic functioning is related to Type D. It would be a great opportunity to conduct studies on athletes because of dynamic development of sport psychology and other scientific areas focused on sport and its improvement.

References

1. Denollet J. Personality, Emotional Distress and Coronary Heart Disease. Eur J Pers. 1997; 11: 343-357.
2. Denollet J. DS14: standard assessment of negative affectivity, social inhibition, and Type D personality. Psychosom Med. 2005; 67(1): 89-97.
3. Basińska MA, Woźniewicz A. The relation between type D personality and the clinical condition of patients suffering from psoriasis. Postepy Dermatol Alergol. 2013; 30(6): 381-387.
4. Ogińska-Bulik N. Osobowość typu D. Łódź: Wydawnictwo Wyższej Szkoły Humanistyczno-Ekonomicznej w Łodzi, 2009.
5. Denollet J. Personality and coronary heart disease: the Type D Scale-16 (DS-16). Ann Behav Med. 1998; 20(3): 209-215.
6. Denollet J. Type D personality: A potential risk factor refined. J Psychosom Res. 2000; 49: 255- 266.
7. Nyklíček I, Vingerhoets A, Denollet J. Emotional (non-) expression and health: data, questions, and challenges. Psychology and Health. 2002; 17(5): 517-528.
8. De Fruyt F, Denollet J. Type D Personality: a Five-Factor Model perspective. Psychology and Health. 2002; 17(5): 671-683.
9. Denollet J, Gidron Y, Vrints ChJ, Conraads VM. Anger, Suppressed Anger, and Risk of Adverse Events in Patients With Coronary Artery Disease. Am J Cardiol. 2010; 105: 1555–1560.
10. Denollet J, Martens EJ, Nyklíček I, Conraads VM, de Gelder B. Clinical Events in Coronary Patients Who Report Low Distress: Adverse Effect of Repressive Coping. Health Psychology. 2008; 27(3): 302-308.
11. Pedersen SS, Denollet J, Ong AT, Serruys PW, Erdman RA, Domburg RT. Impaired health status in Type D patients following PCI in the drug-eluting stent era. Int J Cardiol. 2007; 114: 358–365.
12. Pelle AJ, Schiffer AA, Smith OR, Widdershoven JW, Denollet J. Inadequate consultation behavior modulates the relationship between Type D personality and impaired health status in chronic heart failure. Int J Cardiol. 2010; 142: 65–71.
13. Chapman BP, Duberstein PR, Lyness JM. The Distressed Personality Type: Replicability and General Health Associations. Eur J Pers. 2007; 21: 911–929.
14. Kupper N, Pelle AJ, Szabó BM, Denollet J. The Relationship between Type D Personality, Affective Symptoms and Hemoglobin Levels in Chronic Heart Failure. PLoS ONE. 2013; 8(3): e58370
15. Pelle AJ, Erdman RAM, van Domburg RT, Spiering M, Kazemier M, Pedersen SS. Type D patients report poorer health status prior to and after cardiac rehabilitation compared to non-type D patients. Ann Behav Med. 2008; 36(2): 167-175.

16. Mommersteeg PM, Pelle AJ, Ramakers C, Szabó BM, Denollet J, Kupper N. Type D personality and course of health status over 18 months in outpatients with heart failure: multiple mediating inflammatory biomarkers. Brain Behav Immun. 2012; 26(2): 301-310.
17. Williams L, O'Connor RC, Grubb N, O'Carroll R. Type D personality predicts poor medication adherence in myocardial infarction patients. Psychology and Health. 2011; 26(6): 703-712.
18. Damen NL, Versteeg H, Boersma E, Serruys PW, van Geuns RJ, Denollet J et al. Depression is independently associated with 7-year mortality in patients treated with percutaneous coronary intervention: results from the RESEARCH registry. Int J Cardiol. 2013; 167(6): 2496-2501.
19. De Jonge P, Denollet J, van Melle JP, Kuyper A, Honig A, Schene AH, et al. Associations of type-D personality and depression with somatic health in myocardial infarction patients. J Psychosom Res. 2007; 63(5): 477-482.
20. Volz A, Schmid JP, Zwahlen M, Kohls S, Saner H, Barth J. Predictors of readmission and health related quality of life in patients with chronic heart failure: a comparison of different psychosocial aspects. J Behav Med. 2011; 34(1): 13-22.
21. Broström A, Strömberg A, Mårtensson J, Ulander M, Harder L, Svanborg E. Association of Type D personality to perceived side effects and adherence in CPAP-treated patients with OSAS. J Sleep Res. 2007; 16(4): 439-447.
22. Yıldırım O, Alçelik A, Canan F, Aktaş G, Sit M, İşçi A, et al. Impaired subjective sleep quality in irritable bowel syndrome patients with a Type D personality. Sleep and Biological Rhythms. 2013; 11: 135-138.
23. Alçelik A, Yıldırım O, Canan F, Eroğlu M, Aktaş G, Şavlı H. A preliminary psychometric evaluation of the type D personality construct in Turkish hemodialysis patients . J Mood. 2012, 2(1): 1-5.
24. Van den Broek KC, Heijmans N, van Assen MA. Anxiety and depression in patients with an implantable cardioverter defibrillator and their partners: a longitudinal study. Pacing Clin Electrophysiol. 2013; 36(3): 362-371.
25. Starrenburg AH, Kraaier K, Pedersen SS, van Hout M, Scholten M, van der Palen J. Association of psychiatric history and type D personality with symptoms of anxiety, depression, and health status prior to ICD implantation. Int J Behav Med. 2013; 20(3): 425-433.
26. Pedersen SS, Spindler H, Johansen JB, Mortensen PT. Clustering of poor device acceptance and Type D personality is associated with increased distress in Danish cardioverter-defibrillator patients. Pacing Clin Electrophysiol. 2009; 32(1): 29-36.
27. Bunevicius A, Brozaitiene J, Staniute M, Gelziniene V, Duoneliene I, Pop VJ, et al. Decreased physical effort, fatigue, and mental distress in patients with coronary artery disease: importance of personality-related differences. Int J Behav Med. 2014; 21(2): 240-247.
28. Spindler H, Kruse C, Zwisler AD, Pedersen SS. Increased anxiety and depression in Danish cardiac patients with a type D personality: cross-validation of the Type D Scale (DS14). Int J Behav Med. 2009; 16(2): 98-107.
29. Van den Broek KC, Martens EJ, Nyklícek I, van der Voort PH, Pedersen SS. Increased emotional distress in type-D cardiac patients without a partner. J Psychosom Res. 2007; 63(1): 41-49.
30. Son YJ, You MA, Song EK. Influence of Type D personality on health-related quality of life among Korean patients with end-stage renal disease. Int J Nurs Pract. 2012; 18(3): 260-267.

31. Messerli-Bürgy N, Barth J, von Känel R, Schmid JP, Saner H, Znoj H. Maladaptive emotion regulation is related to distressed personalities in cardiac patients. Stress Health. 2012; 28(4): 347-352.
32. Nefs G, Pouwer F, Pop V, Denollet J. Type D (distressed) personality in primary care patients with type 2 diabetes: validation and clinical correlates of the DS14 assessment. J Psychosom Res. 2012; 72(4): 251-257.
33. Mols F, Thong MS, van de Poll-Franse LV, Roukema JA, Denollet J. Type D (distressed) personality is associated with poor quality of life and mental health among 3080 cancer survivors. J Affect Disord. 2012; 136(1-2): 26-34.
34. Romppel M, Herrmann-Lingen C, Vesper JM, Grande G. Type D personality and persistence of depressive symptoms in a German cohort of cardiac patients. J Affect Disord. 2012; 136(3): 1183-1187.
35. Svansdottir E, van den Broek KC, Karlsson HD, Gudnason T, Denollet J. Type D personality is associated with impaired psychological status and unhealthy lifestyle in Icelandic cardiac patients: a cross-sectional study. BMC Public Health. 2012; 12, 42.
36. Svansdottir E, Karlsson HD, Gudnason T, Olason DT, Thorgilsson H, Sigtryggsdottir U, et al.Validity of Type D personality in Iceland: association with disease severity and risk markers in cardiac patients. J Behav Med. 2012; 35(2): 155-166.
37. McCrae RR, Costa JrPT. Osobowość dorosłego człowieka. Kraków: Wydawnictwo WAM, 2005.
38. Van den Broek KC, Kupper N, van der Voort PH, Alings M, Denollet J, Nyklíček I. Trajectories of perceived emotional and physical distress in patients with an implantable cardioverter defibrillator. Int J Behav Med. 2014; 21(1): 149-159.
39. Dubayova T, Krokavcova M, Nagyova I, Rosenberger J, Gdovinova Z, Middel B, et al. Type D, anxiety and depression in association with quality of life in patients with Parkinson's disease and patients with multiple sclerosis. Qual Life Res. 2013; 22(6): 1353-1360.
40. Klaassen K, Nyklíček I, Traa S, de Nijs R. Distressed personality is associated with lower psychological well-being and life satisfaction, but not disability or disease activity in rheumatoid arthritis patients. Clin Rheumatol. 2012; 31(4): 661-667.
41. Zhang Y, Li H, Zou S. Association between Cognitive Distortion, Type D Personality, Family Environment, and Depression in Chinese Adolescents. Depress Res Treat. 2011; 2011: 1-8.
42. Marchesi C, Ossola P, Scagnelli F, Paglia F, Aprile S, Monici A, et al. Type D personality in never-depressed patients and the development of major and minor depression after acute coronary syndrome. J Affect Disord. 2014; 155: 194-199.
43. Yu XN, Chen Z, Zhang J, Liu X. Coping mediates the association between Type D personality and perceived health in Chinese patients with coronary heart disease. Int J Behav Med. 2011; 18(3): 277-284.
44. Mols F, Denollet J, Kaptein AA, Reemst PH, Thong MS. The association between Type D personality and illness perceptions in colorectal cancer survivors: a study from the population-based PROFILES registry. J Psychosom Res. 2012; 73(3): 232-239.
45. Williams L, O'Connor RC, Grubb NR, O'Carroll RE. Type D personality and illness perceptions in myocardial infarction patients. J Psychosom Res. 2011; 70(2): 141-144.
46. Yu XN, Chen Z, Zhang J, Liu X. Coping mediates the association between Type D personality and perceived health in Chinese patients with coronary heart disease. Int J Behav Med. 2011; 18(3): 277-284.
47. Chen J, Liu Y, Cai Q, Liu Y, Wang T, Wang J, et al. Depression in parents of children with leukemia in southern China accompanied by the prevalence of type D personality. Support Care Cancer. 2014; 22(5): 1277-1286.

48. Aquarius AE, Denollet J, Hamming JF, De Vries J. Role of disease status and type D personality in outcomes in patients with peripheral arterial disease. Am J Cardiol. 2005; 96(7): 996-1001.
49. Dubayova T, Nagyova I, Havlikova E, Rosenberger J, Gdovinova Z, Middel B, et al. The association of type D personality with quality of life in patients with Parkinson's disease. Aging Ment Health. 2009; 13(6): 905-912.
50. Sararoudi RB, Afshar H, Adibi P, Daghaghzadeh H, Fallah J, Abotalebian F. Type D personality and quality of life in patients with irritable bowel syndrome. J Res Med Sci. 2011; 16(8): 985-992.
51. Mols F, Holterhues C, Nijsten T, van de Poll-Franse LV. Personality is associated with health status and impact of cancer among melanoma survivors. Eur J Cancer. 2010; 46(3): 573-580.
52. Habibović M, van den Broek KC, Alings M, Van der Voort PH, Denollet J. Posttraumatic stress 18 months following cardioverter defibrillator implantation: shocks, anxiety, and personality. Health Psychol. 2012; 31(2): 186-193
53. Pelle AJ, Pedersen SS, Szabó BM, Denollet J. Beyond Type D personality: reduced positive affect (anhedonia) predicts impaired health status in chronic heart failure. Qual Life Res. 2009; 18(6): 689-698.
54. Schiffer AA, Pedersen SS, Widdershoven JW, Denollet J. Type D personality and depressive symptoms are independent predictors of impaired health status in chronic heart failure. Eur J Heart Fail. 2008; 10(8): 802-810.
55. Whitehead DL, Perkins-Porras L, Strike PC, Magid K, Steptoe A. Cortisol awakening response is elevated in acute coronary syndrome patients with type-D personality. J Psychosom Res. 2007; 62(4): 419-425.
56. Kupper N, Pedersen SS, Höfer S, Saner H, Oldridge N, Denollet J. Cross-cultural analysis of type D (distressed) personality in 6222 patients with ischemic heart disease: a study from the International HeartQoL Project. Int J Cardiol. 2013; 166(2): 327-333.
57. Bunevicius A, Brozaitiene J, Staniute M, Gelziniene V, Duoneliene I, Pop VJ, et al. Decreased physical effort, fatigue, and mental distress in patients with coronary artery disease: importance of personality-related differences. Int J Behav Med. 2014; 21(2): 240-247.
58. Mommersteeg PM, Pot I, Aarnoudse W, Denollet J, Widdershoven JW. Type D personality and patient-perceived health in nonsignificant coronary artery disease: the TWeesteden mIld STenosis (TWIST) study. Qual Life Res. 2013; 22(8): 2041-2050.
59. Pedersen SS, Holkamp PG, Caliskan K, van Domburg RT, Erdman RA, Balk AH. Type D personality is associated with impaired health-related quality of life 7 years following heart transplantation. J Psychosom Res. 2006; 61(6): 791-795.
60. Martin LA, Doster JA, Critelli JW, Lambert PL, Purdum M, Powers C, et al. Ethnicity and Type D personality as predictors of heart rate variability. Int J Psychophysiol. 2010; 76(2): 118-121.
61. Howard S, Hughes BM. Type D personality is associated with a sensitized cardiovascular response to recurrent stress in men. Biol Psychol. 2013; 94(2): 450-455.
62. Condén E, Ekselius L, Aslund C. Type D personality is associated with sleep problems in adolescents. Results from a population-based cohort study of Swedish adolescents. J Psychosom Res. 2013; 74(4): 290-295.
63. Mommersteeg PM, Kupper N, Denollet J. Type D personality is associated with increased metabolic syndrome prevalence and an unhealthy lifestyle in a cross-sectional Dutch community sample. BMC Public Health. 2010; 10,714.

64. Van Bon-Martens MJ, Denollet J, Kiemeney LA, Droomers M, de Beer MJ, van de Goor IA, et al. Health inequalities in the Netherlands: a cross-sectional study of the role of Type D (distressed) personality. BMC Public Health. 2012; 12,46.
65. Larson NC, Barger SD, Sydeman SJ. Type D personality is not associated with coronary heart disease risk in a North American sample of retirement-aged adults. Int J Behav Med. 2013; 20(2): 277-285.
66. Nyklíček I, Vorselaars A, Denollet J. Type D personality and cardiovascular function in daily life of people without documented cardiovascular disease. Int J Psychophysiol. 2011; 80(2): 139-142.
67. Mommersteeg PM, Herr R, Bosch J, Fischer JE, Loerbroks A. Type D personality and metabolic syndrome in a 7-year prospective occupational cohort. J Psychosom Res. 2011; 71(5): 357-363.
68. Lee MS, Lim HE, Ko YH, Han C, Kim YK, Yang J, et al. Characteristics of Type D personality in Korean adolescents. Eur Child Adolesc Psychiatry. 2012; 21(12): 699-706.
69. Michal M, Wiltink J, Kirschner Y, Wild PS, Münzel T, Ojeda FM, et al. Differential associations of depressive symptom dimensions with cardio-vascular disease in the community: results from the Gutenberg health study. PLoS One. 2013; 8(8),e72014.
70. Pedersen SS, Yagensky A, Smith OR, Yagenska O, Shpak V, Denollet J. Preliminary evidence for the cross-cultural utility of the type D personality construct in the Ukraine. Int J Behav Med. 2009; 16(2): 108-115.
71. Svansdottir E, van den Broek KC, Karlsson HD, Olason DT, Thorgilsson H, Denollet J. The distressed (Type D) and Five-Factor Models of personality in young, healthy adults and their association with emotional inhibition and distress. Personality and Individual Differences, 2013; 55: 123-128.
72. Michal M, Wiltink J, Grande G, Beutel ME, Brähler E. Type D personality is independently associated with major psychosocial stressors and increased health care utilization in the general population. J Affect Disord. 2011; 134(1-3): 396-403.
73. Kunst MJ, van Bon-Martens MJ. Examining the Link Between Domestic Violence Victimization and Loneliness in a Dutch Community Sample: A Comparison Between Victims and Nonvictims by Type D Personality. J Fam Violence. 2011; 26(5): 403-410.
74. Kunst MJJ, Bogaerts S, Winkel FW. Peer and inmate aggression, type D-personality and post-traumatic stress among Dutch prison workers. Stress and Health. 2009; 25(5): 387-395.
75. Rademaker AR, van Zuiden M, Vermetten E, Geuze E. Type D personality and the development of PTSD symptoms: a prospective study. J Abnorm Psychol. 2011; 120(2): 299-307
76. Mommersteeg PM, Denollet J, Kavelaars A, Geuze E, Vermetten E, Heijnen CJ. Type D personality, temperament, and mental health in military personnel awaiting deployment. Int J Behav Med. 2011; 18(2): 131-138.
77. Ogińska-Bulik N. Occupational stress and its consequences in healthcare professionals: the role of type D personality. Int J Occup Med Environ Health. 2006; 19(2): 113-122.
78. Polman R, Borkoles E, Nicholls AR. Type D personality, stress, and symptoms of burnout: the influence of avoidance coping and social support. Br J Health Psychol. 2010; 15: 681-696.
79. Williams L, O'Connor RC, Howard S, Hughes BM, Johnston DW, Hay JL, et al. Type-D personality mechanisms of effect: the role of health-related behavior and social support. J Psychosom Res. 2008; 64(1): 63-69.

80. Borkoles E, Polman R, Levy A. Type-D personality and body image in men: the role of exercise status. Body Image. 2010; 7(1): 39-45.
81. Howard S, Hughes BM. Construct, concurrent and discriminant validity of Type D personality in the general population: associations with anxiety, depression, stress and cardiac output. Psychol Health. 2012; 27(2): 242-258.
82. Altmaier E, Emeny RT, Krumsiek J, Lacruz ME, Lukaschek K, Häfner S, et al. Metabolomic profiles in individuals with negative affectivity and social inhibition: a population-based study of Type D personality. Psychoneuroendocrinology. 2013; 38(8): 1299-1309.
83. Karaminia R, Soltani MA, Bagherian-Sararoudi R. Prediction of elders' general health based on positive and negative perfectionism and type-d personality. Int J Prev Med. 2013; 4(6): 641-647.
84. Kasai Y, Suzuki E, Iwase T, Doi H, Takao S. Type D personality is associated with psychological distress and poor self-rated health among the elderly: a population-based study in Japan. PLoS One. 2013; 8(10),e77918.
85. Martin LA, Doster JA, Critelli JW, Purdum M, Powers C, Lambert PL et al. The 'distressed' personality, coping and cardiovascular risk. Stress and Health. 2011; 27: 64-72.
86. Williams L, O'Carroll RE, O'Connor RC. Type D personality and cardiac output in response to stress. Psychol Health. 2009; 24(5): 489-500.
87. Williams L, Wingate A. Type D personality, physical symptoms and subjective stress: the mediating effects of coping and social support. Psychol Health. 2012; 27(9): 1075-1085.