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Cardiovascular disease and meaning in life: A systematic literature review and conceptual model

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Review Article

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Abstract

Objectives. Previous studies have shown that psychological stress and mental health problems increase the risk for cardiovascular disease (CVD) events, such as heart attack or stroke. Furthermore, after CVD events, the majority of patients report large stress. However, psychological treatments have only modest effects in CVD patients. Therefore, it has been argued that new conceptual models are needed to understand the aetiology of stress and mental health problems in CVD patients. Therefore, this study included a systematic literature review and a conceptual model on the role of meaning in life for psychological stress, mental health, and CVD risks.

Methods. A systematic literature review was conducted on relationships between CVD and meaning in life. PRISMA/MOOSE review guidelines were followed. These findings were used to build a conceptual model.

Results. The literature review included 113 studies on meaning and CVD. The included studies described meaning as a predictor of cardiovascular risks and health, meaning-centered needs of patients in conversations with medical staff, meaning-centered changes after CVD events, meaning-centered coping with CVD, meaning as motivator of CVD-related lifestyle changes, and meaning as an element in psychological treatments of CVD patients. In sum, the literature showed that a central clinical concern for patients is their question how to live a meaningful life despite CVD. Meaning-centered concerns seem to lead to lower motivation to make lifestyle changes, more psychological stress, lower quality-of-life, worse physical well-being, and increased CVD risk. The ability to live a meaningful life after CVD events is related with lower stress, better mental health, and several biomarkers.

Significance of results. An evidence-based conceptual framework was developed for the relationship between meaning and CVD. It may be hypothesized CVD patients may benefit from psychological therapies focused on meaning.

Introduction

Cardiovascular disease (CVD) is one of the most prevalent life-threatening health conditions in western countries, associated with relatively high mortality rates. Cardiovascular events such as heart attack or stroke often lead to heightened levels of psychological stress, depression, and anxiety (Konstam et al., 2005). It is also widely recognized that reducing stress and mental health problems is crucial to the prevention and recovery of cardiovascular events (Whalley et al., 2011). Therefore, national health guidelines, for instance by the British National Health Service, recommend offering psychological counseling to CVD patients (Gillham and Clark, 2011; Smith and Kneebone, 2016).

Despite the importance of mental health care for CVD, only 24 psychological clinical trials have been published (Whalley et al., 2011; Tan and Morgan, 2015). These studies show that these treatments have only small effects on anxiety and depression and no consistent positive effects on outcomes such as quality-of-life and physical well-being. The statistical heterogeneity between studies is large, which makes it difficult to generalize findings. Interventions mainly include behavioral and cognitive exercises, such as relaxation, self-awareness, self-monitoring, risk education, emotional support, homework, behavior change guidance, and cognitive techniques (Whalley et al., 2011). In most studies, the therapeutic mechanisms leading to therapeutic change are not directly measured, thus it remains unknown how these interventions precisely lead to improvement. Thus, most psychological interventions in CVD have insufficient validity and efficacy. Therefore, it has been argued that new conceptual models are needed to understand the aetiology of stress and mental health problems in CVD patients. Such a new model may help to develop new — potentially more effective — psychological therapies (Carroll and Nuro, 2002; Rounsaville et al., 2006; Moore et al., 2015).

The aim of this study is to conduct a systematic literature review on the relationship between meaning and CVD, which will be used to develop a conceptual model, — which may be used as foundations for the development of new psychological treatments focusing

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on meaning. This focus on meaning follows from the growing literature on the relationship between CVD and positive psychological attributes, and particularly meaning-making (Park, 2010; Boehm and Kubzansky, 2012; Dubois et al., 2012). This meaning-centered paradigm could explain the relative lack of effects of the usual care for CVD. For example, cognitive-behavioral therapy does not systematically address the central question that most patients with a chronic or life-threatening physical disease such as CVD ask: "How can I live a meaningful and satisfying life despite my disease?" (Vos, 2016a). Their primary concerns seem more related to their quest for meaning than to cognitive or behavioral issues. Research indicates that physically ill patients need to make sense of the disease and fit this into their overall perspective on life; they could subsequently experience psychological stress due to the tensions between these situational and global meanings (Park and Folkman, 1997). Table 1 summarizes the empirical evidence from previous reviews for the relevance of meaning in coping with a chronic or life-threatening physical disease other than CVD (Vos, 2016a, 2016b). For example, this shows how meaning is an evidence-based psychological construct, which can be differentiated from other phenomena (Park and Folkman, 1997; Park, 2010). A large body of the literature shows that in the general population, a lack of meaning leads to lower quality-of-life, higher levels of stress, and worse physical health such as higher blood pressure and suppressed immune system (Ryff et al., 2004; Vos, 2016b).

Method

Several authors have published systematic literature reviews on general psychological causes and consequences of CVD (Rozanski et al., 1999; Dimsdale, 2008). A systematic meta-analysis on psychological treatments was published by Whalley et al. (2014). Other reviews also describe the literature on general positive psychology in CVD (Boehm and Kubzansky, 2012). Some reviews describe meaning amongst other factors (Rozanski et al.,

Table 1. Overview of evidence-based characteristics of meaning in life (based on the review in Vos, 2016a, 2017)

Characteristic	Description
Definition	The meaning construct consists of seven highly correlated experiences: 1. Motivation (purpose, goals, direction), 2. Values, 3. Understanding of life events and surrounding world (sense of coherence), 4. Self-worth, 5. Commitment to action, 6. Self-regulation (control, setting and adjusting goals), and 7. Accepting existential limitations.
Types of meaning	*A world-wide review showed individuals experience 5 types and 27 sub-types of meaning*: • Material-hedonic type (material conditions, professional-educational success, hedonic-experiential activities, and health) • Self-oriented type (resilience, self-efficacy, self-acceptance, autonomy, creative self-expression, self-care, and authenticity) • Social type (connections, belonging, altruism, and children) • Larger type (higher purpose, personal growth, temporal coherence, justice and ethics, and spirituality and religion) • Existential-philosophical type (being-alive, uniqueness, embeddedness, freedom, gratitude, and responsibility)
Large correlations in general population	*A strong sense of meaning is highly correlated with*: • Low level of psychological stress (e.g., anxiety and depression), • High level of acceptance of life's limitations and low level of existential stress (e.g., fear of death), • High level of quality-of-life (e.g., life satisfaction), • Better self-reported physical well-being (e.g., pain perception) and biomarkers (e.g., immune system, blood pressure, and survival rate).
Meaning-centered changes after diagnosis of a chronic or life-threatening disease	*Changes in specific meanings* • All specific pre-disease meanings stay the same • A specific pre-disease meaning becomes more valuable • A specific pre-disease meaning feels less valuable • A specific pre-disease goal is adjusted • A specific pre-disease meaning becomes unattainable • A specific new meaning develops
	Changes in general perspectives • General priorities in life change • Experiencing life more intensively • Focusing more on authentic meanings • Such a narrow focus on life's limitations, that other meanings are forgotten or denied • Hyper-reflection or hyper-intention (i.e., wanting a specific meaning very strong and/or strongly reflecting on it) • Experiencing meaninglessness • More realistic about life's limitations • Existential stress, e.g., fear of death
Effects of meaning-oriented therapy	*Meaning-oriented therapy has large to very large significant effects in 60 trials in physically ill and/or mentally ill populations, compared with active interventions:* • Larger quality-of-life; • Larger acceptance and lower existential stress; • Lower psychological stress; • Better self-reported physical well-being and biomarkers (24 trials).

2005; Leegaard and Fagermoen, 2008; Cohen et al., 2016; Sin, 2016). However, these studies do not review all meaning-centered aspects of meaning in CVD. Therefore, a systematic literature review was conducted on meaning and CVD. Meaning was defined as described in Table 1.

A systematic scoping literature review was conducted in consecutive rounds. A review protocol was developed in line with PRISMA and MOOSE-guidelines (Stroup et al., 2000; Liberati et al., 2009), which can be requested from the authors. The aim of this review was to search for any studies with or without interventions, with or without comparisons on the relationship between meaning in life and CVD. Meaning in life was defined as in Table 1. CVD was defined as any type of cardiovascular event or cardiovascular surgery (e.g., acute coronary syndrome, acute myocardial infarction, coronary artery bypass grafting, recovery of coronary artery or heart disease, and cerebrovascular accident).

First, databases were searched and included Pubmed, Web-of-Knowledge, PsycInfo, PsycTest, Medline, Embase, scholar.google.com, and Scopus. Two sets of search terms were combined. The set of terms regarding meaning was derived from previous reviews (Vos and Vitali, 2018) and included: "meaning in life" or "meaning of life" or "life meaning" or "meaningful life" or "living meaningful*" or "noetic" or "purpose in life" or "purpose of life" or "life purpose" or "purposes in life" or "purposes of life" or "life's purpose" or "goal in life" or "goal of life" or "goals of life" or "goals in life" or "life's goal*" or "value* in life" or "life's value*" or "significance of life" or "life destiny" or "destiny in life" or "destiny of life" or "life* essence" or "essence of life" or "sense of life" or "aims in life" or "aims of life" or "life* aims" or "meaning-making" or "existential" or "positive psychol*." The set of terms regarding CVD included: "cardiovascular" or "heart" or "stroke" or "cardiac" or "cardiolog*" or "coronary" or myocardial or cerebrovascular*. Given the large number of findings, we added PubMed Mesh terms ([counseling] OR [psychotherapy] OR [psychology]) and capped scholar.google.com results at 10,000 hits. Additional studies were identified via the reference lists. Second, meaning-centered experts excluded articles through thorough reading of the titles and abstracts. Third, studies were excluded on basis of full-text manuscripts. Fourth, all studies are summarized and presented in the text. Fifth, risk of bias was assessed via the Cochrane risk of bias tool. Studies with a large risk of bias are described separately in the Findings section (Table 2).

Sixth, articles were synthesized via thematic analyses (Clarke et al., 2015). We did not limit the research findings to any specific variables, as we wanted to get a full overview of the relationships between CVD and meaning in life. We did not conduct meta-analyses due to the heterogeneity of instruments and study designs; therefore, we did also not present the detailed characteristics of each study. However, in the reporting of the studies, we summarize the average effects reported in the studies based on

Table 2. Overview of studies on meaning in CVD

Study topic	Number of studies	Reference
Meaning as predictor of cardiovascular health and disease risk in general population	11	Edmondson et al., 2005; Skrabski et al., 2005; Ishida and Okada, 2006; Sone et al., 2008; Shirai et al., 2009; Tanno et al., 2009; Mezick et al., 2010; Kim et al., 2013; Rohleder, 2014; Yu et al., 2015; Cohen et al., 2016
Positive well-being (associated with meaning) as predictor of cardiovascular health and disease risk in general population	19	Rozanski and Kubzansky, 2005; Chida and Steptoe, 2008; Chida and Hamer, 2008; Kožul et al., 2009; Davidson et al., 2010; Low and Lam., 2013; Boehm et al., 2011, 2015; Hamer and Chida, 2011; Boehm and Kubzansky, 2012; DuBois et al., 2012; Steptoe et al., 2012; Falk et al., 2013; Haukkala et al., 2013; Hoen et al., 2013; Schwerdtfeger and Gerteis, 2014; Lambiase et al., 2015; Marteinsdottir et al., 2016; Sin, 2016.
Meaning-centered needs in conversation about CVD with doctors and nurses	4	Schaufel et al., 2009; Kohlmann et al., 2013; McClung, 2013; Strang et al., 2013; Barello et al., 2015
Meaning-centered changes and needs after CVD event	30	Mårtensson et al., 1998; Popogrebsky, 1998; Clarke et al., 1999; Nilsson et al., 1999; Ecochard et al., 2001; Davidson et al., 2003; Secrest and Zeller, 2003; Faircloth et al., 2004; Lobeck et al., 2005; Secrest and Zeller, 2006; Cortis and Williams, 2007; Leegaard and Fagermoen, 2008; Schou and Egerod, 2008; Wann-Hansson et al., 2008; Bremer et al., 2009; Hefferon et al., 2009; Rassin et al., 2009; Eilertsen et al., 2010; Kutner, 2010; Silva et al., 2011; Lawrence and Kinn, 2012; Andersson et al., 2013; Ross and Austin, 2013; Junehag et al., 2014; Leeming et al., 2014; Buck et al., 2015; DuBois et al., 2015; Hansen et al., 2016; Satink et al., 2016; Littooij et al., 2016.
Meaning-centered coping with congenital heart disease	4	Mårtensson et al., 1997; Amianto et al., 2013; Berghammer et al., 2015; Apers et al., 2016.
Meaning and meaning-centered coping as predictor of long-term physical and psychological well-being in CVD patients	18	Muirhead et al., 1992; Evangelista et al., 2003; Rozanski et al., 2005; Park et al., 2007; Balon et al., 2008; Ai et al., 2009, 2010, 2012; Owolabi, 2009; Vollman et al., 2009; Sirri et al., 2010; Bekke-Hansen et al., 2013; Kim et al., 2013; Shao et al., 2013; Grohn et al., 2014; Sacco et al., 2014; Simonÿ et al., 2015; Huffman et al., 2016b; Sarfo et al., 2017.
Meaning and meaning-associated positive psychological factors as predictor of CVD-related lifestyle changes	15	Laerum et al., 1991; Tinker et al., 2007; Holahan et al., 2008; Cuffee, 2010; Ogedegbe et al., 2012; Peterson et al., 2012; Proyer et al., 2013; Versteeg et al., 2013; Charlson et al., 2014; Ronaldson et al., 2015; Røysland and Friberg, 2015; Simonÿ et al., 2015; Sin et al., 2015; Huffman et al., 2016a, 2016b; Van Montfort et al., 2016.
Meaning-centered and meaning-associated positive psychological treatments of CVD patients	12	Krucoff et al., 2001, 2005; Kennedy et al., 2007; Lantz and Gregoire, 2003; Seskevich et al., 2004; Burton et al., 2010; Roncella et al., 2013; Huffman et al., 2016a; Lee et al., 2016; Nikrahan et al., 2016a, 2016b; Sanjuán et al., 2016.

their unweighted average. For example, we describe R^2 of 0.75 as large, 0.50 moderately large, and 0.25 small. However, this presentation of effect size should be read as indicative only.

On the basis of this literature review, a conceptual model was developed, by combining this with a pre-existing review of meaning in other chronic and life-threatening diseases (Vos, 2016a) and a review of the mechanisms of meaning-centered treatments (Vos, 2016b, 2017). Several authors have argued that a conceptual model needs to integrate all relevant literature while being concise, and this describes the central clinical phenomenon, aetiology, mechanisms of change, and impact on patients (Wampold, et al., 1997; Kazdin, 2009; Moore et al., 2015; Vos, 2017). The logical model is visualized.

Findings

Findings

17,084 publications were found, of which 113 were selected, reflecting 21,509 patients (see Figure 1).

Eleven studies described meaning as a moderately strong predictor of cardiovascular risks. Nineteen studies described meaning as part of positive well-being and showed how positive well-being is a moderately strong predictor of cardiovascular health and lower CVD risk in the general population. Four studies described that CVD patients spontaneously ask questions about meaning with doctors and nurses. Thirty studies described changes in meaning in life and questions about meaning in life after a CVD event. Four studies described the positive effects of a meaning-oriented coping-style on adjusting to living with a congenital heart disease and reducing psychological stress, such as focusing on what is meaningful in life instead of on the limitations in life. Eighteen studies described meaning-centered coping as a predictor of long-term physical and psychological well-being in CVD patients. Fifteen studies described that experiencing life as meaningful and/or using meaning-oriented coping-styles predict CVD-related lifestyle changes in CVD patients, such as dieting and exercising. Twelve studies described psychological intervention studies in CVD patients which had one or more meaning-oriented aspects (most of which were positive psychology interventions), and which indicated moderate to large improvements in psychological well-being.

Analyses of risk of bias for the correlational studies indicated good or acceptable risk for all studies. Analyses of risk of bias revealed a significant risk for 10 out of 12 clinical trials, due to lack of control groups, unclear blinding and in 3 studies incomplete data reporting.

Meaning-centered conceptual model

The literature from the previous step was combined with other studies on the psychological aspects of coping with CVD, and on meaning in other chronic and life-threatening physical diseases. Figure 2 summarizes the meaning-centered model of CVD. This is followed by a description of the treatment manual that is based on this meaning-centered model.

Predictors of CVD event

Empirical studies have suggested many factors which seem to increase the risk of CVD events. This includes, amongst others, biomedical risks such as genetics and body weight; lifestyle factors such as diet and exercise; level of psychological stress; stress reactivity and anxiety (Roest et al., 2010); personality such as type A

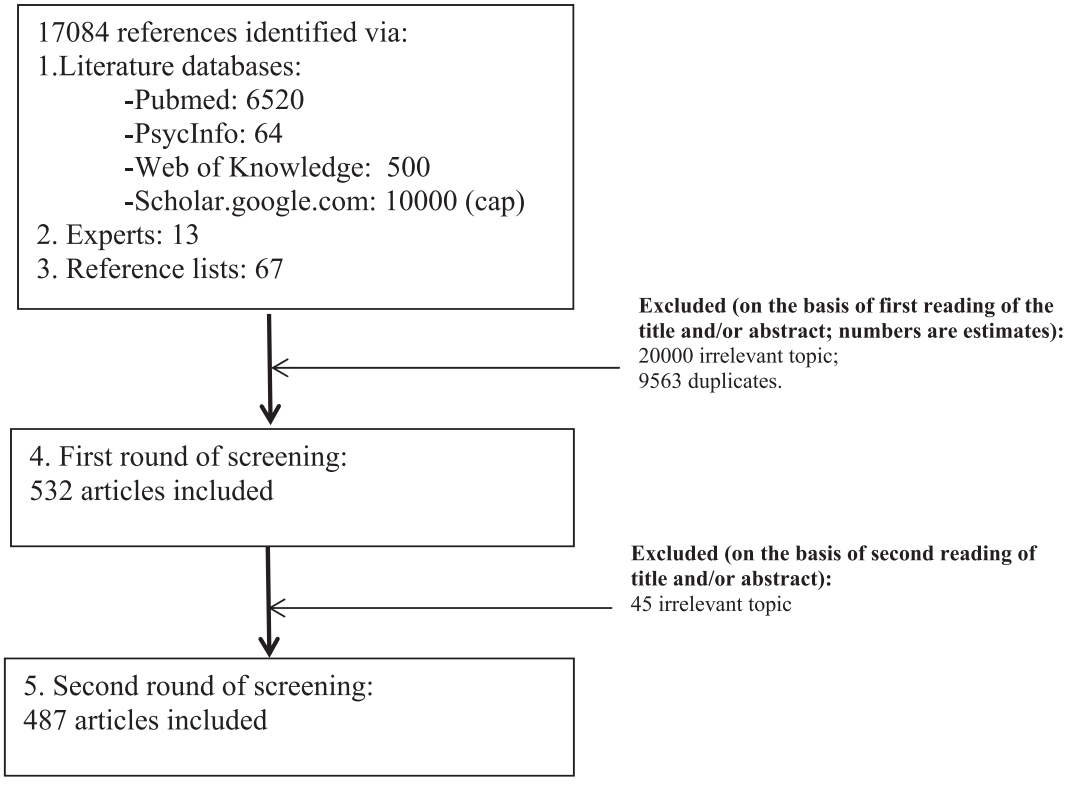

Fig. 1. Flowchart of included and excluded studies.

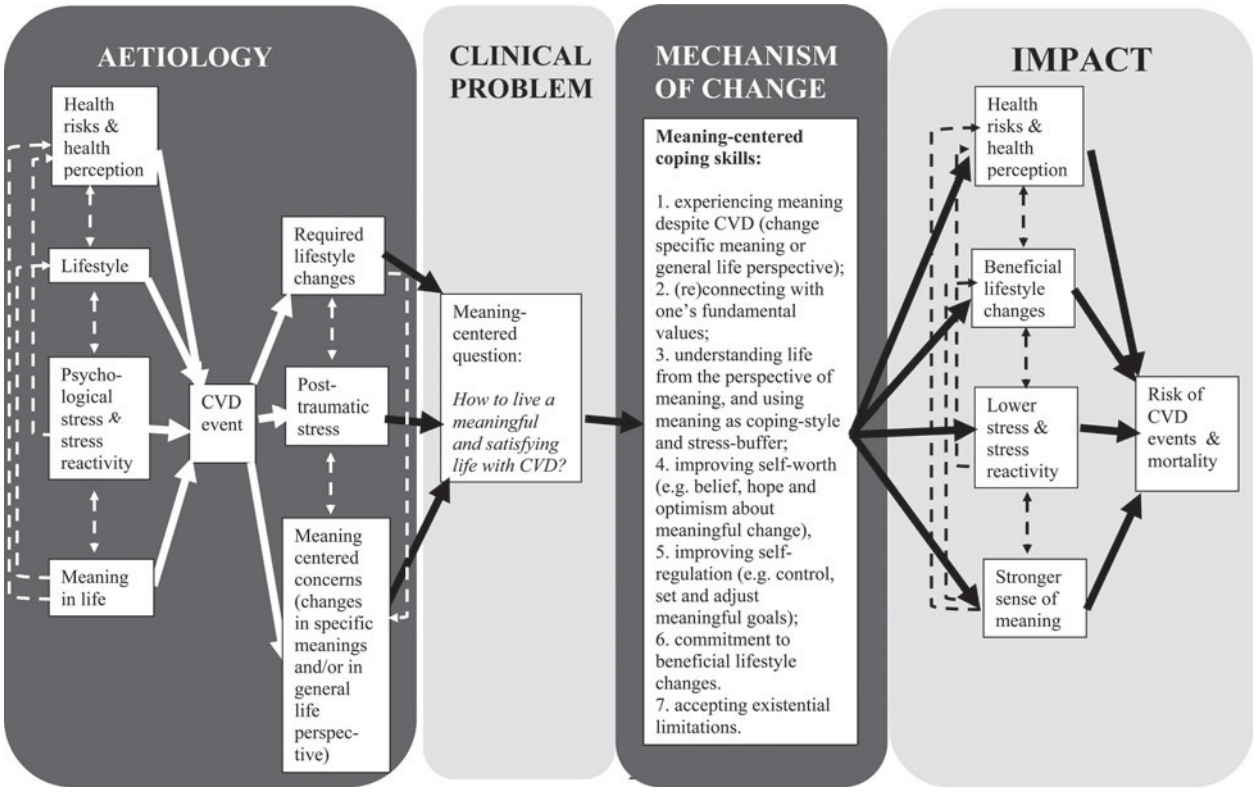

Fig. 2. Logical meaning-centered model of CVD.

and hostility(Chida and Steptoe, 2008); and quality-of-life such as optimism and meaning (Dubois et al., 2012). The effect of socio-demographic and life history risk factors on stress and CVD risks are mediated by meaning-centered coping (Chen et al., 2015; Su et al., 2015). For example, meaning-centered coping-styles reduce the level of psychological stress (Kopp et al., 2007; Bennett et al., 2014b). These factors are likely intertwined, such as high stress levels leading to chronic inflammation which could contribute to CVD risks (Rohleder, 2014; type A personality is associated with high levels of stress and low quality-of-life; physical exercise may also reduce stress; Scully et al., 1998).

Post-CVD event

After patients have experienced a CVD event, they may be required to make lifestyle changes, possibly because their disease makes it impossible to do the activities they did in the past, or they need to lower their CVD risk, for instance by exercising or stopping smoking. However, research shows that many patients find it difficult to make these changes, particularly due to a lack of motivation; therefore, intervention studies suggest that their motivation could be improved by focusing on the positive meaning of these activities for their life in general (Tinker et al., 2007). Many patients experience CVD events also as psychologically traumatic, particularly because it confronts them with the limitations and finitude of life, which may subsequently increase their level of psychological stress and decrease their quality-of-life and increase their risk of another CVD event (Nilsson et al., 1999; Stoll et al., 2000; Coughlin, 2011). Like other potentially life-threatening diseases, the CVD event has suddenly confronted them with their limitations and finitude, they need to change parts of their life, and they may develop new general perspectives on life (LeMay and Wilson, 2008). Qualitative studies show that many patients feel stuck in a vicious cycle of limitation and resignation, and they need to "use self-care" and "see the possibilities that exist in everyday life" (Mårtensson et al., 1997). People start to search for meaning in response to the existential limitations that CVD has confronted them with (Koizumi et al., 2008). Thus, the core psychological question of coping with a CVD event and its aftermath seems to be their question: "how can I live a meaningful and satisfying life, despite the disease and the changes in my life?"

Meaning-oriented coping

Patients may have a broad range of answers to this question, as reviewed elsewhere (Vos, 2016a, 2017). This model focuses on the core component of meaning, which is mentioned in many of the dominant medical and health psychology paradigms, such as stress-coping and appraisal models (Park and Folkman, 1997; Lee et al., 2016), terror management theory (Solomon et al., , 2015), motivation psychology and motivational interviewing (Lundahl et al., 2013), post-traumatic growth (Tedeschi et al., 1998), and the recovery model (Bennett et al., 2014a). Similar to other diseases, several studies have shown that positive well-being, including meaning, is associated with lower cardiovascular risks and ill-being, albeit with modest effect sizes possibly because the effects are mediated by other factors such as lifestyle changes, stress level and biophysical changes (Boehm et al., 2011).

Long-term impact

When individuals can make sense of their disease and its treatment, they are more motivated for the required lifestyle changes (ibidem). Meaning-centered coping skills follow from the concept

of meaning, which is an empirically validated experience, associated with motivation, values, self-worth, understanding and self-insight, self-worth, self-regulation, and goal-setting (Vos, 2016a, 2017). A review of 45,000 individuals world-wide show that individuals find meaning via material-hedonic, self-oriented, social, larger, or existential-philosophical types of meaning (ibidem). Research indicates that patients directly benefit from exploring a wide number of meanings (ibidem). Thus, meaning-centered coping-styles include a well-established range of skills, of which the most important are: accepting the disease and its limitations; experiencing meaning despite change (i.e., continued meanings, new meanings, transcending the situation, and new perspectives on life); using meaning as resilience and stress-buffer; beneficial coping-styles; hope and optimism; self-efficacy; and motivation to lifestyle change (ibidem).

Discussion

This systematic literature review has shown how meaning is a moderately strong predictor of the occurrence of a CVD event and of the short-term and long-term psychological and physical impact of CVD. To make sense of this literature, other studies were integrated in the development of a logical meaning-centered model of CVD. This model indicated the central role that meaning plays for patients before and after CVD events.

Systematic studies need to further confirm the meaning-centered model, and particularly examine how individuals create and adjust meaning after CVD events. There is a risk of confirmation bias due to reviewing only literature on meaning, and not searching for other literature on other CVD-related mechanisms.

Following the systematic literature review, CVD patients may be recommended to improve their sense of meaning in life, to reduce their CVD risk, and to improve their mental and physical well-being on short-term and long-term. As an improved sense of meaning in life seems to have moderately strong positive effects on these outcomes. Our review suggests that the effect size of meaning on CVD is similar or larger than the effect sizes for usual recommendations to improve the outcomes after a CVD event, such as stopping with smoking, reducing body weight, or using statins (Kannell and Higgins, 1990; Law et al., 2003; Lee et al., 2008; Rizos et al., 2012). Although more systematic and longitudinal studies are warranted to confirm the strengths of these relationships, these findings indicate the importance of meaning in life in the recovery after CVD events. One of the ways to improve this could be to offer meaning-oriented therapy (Vos, 2016a, 2017).

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