Psychological interventions in cardiovascular disease: an update

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Purpose of review
To evaluate recent literature on psychological interventions in cardiovascular disease.

Recent findings
Mindfulness-based stress reduction did not reduce blood pressure, and a self-management programme in heart failure patients (HART), showed no improvement in health-related quality of life. Web-based decision aids are as effective as individually tailored counseling at reducing cardiovascular risk. Among health attack survivors, the ProActive Heart study involving telephone delivered counseling reduced anxiety whereas integrated motivational interviewing cognitive behavioral therapy (Beating Heart Problems) reduced depression and anger with no physiological or behavioral benefits.

Summary
Psychological conditions increase cardiovascular risk as well as complicate cardiovascular disease. Psychological interventions are, however, far less studied compared with pharmacological and device therapies for cardiovascular disease. Interventions can either be delivered in isolation or in combination with other interventions including education, exercise, and medications, whereas outcomes measured could include psychometrics, behavior, risk scores, cardiovascular endpoints, and mortality. Due to the large variety of possible interventions and outcomes, published studies have reported mixed results and it remains unclear which modes of delivery and which types of intervention are most appropriate.

Keywords
cardiovascular, coronary heart disease, depression, heart failure, psychology

INTRODUCTION
Cardiovascular disease is the single largest cause of mortality in developing countries [1]. In addition, it is associated with significant morbidity and reduced quality of life. Although cardiovascular research involving numerous surgical, noninvasive, and pharmacological interventions dominates the medical literature, far less research has evaluated psychological interventions as both primary and secondary prevention of cardiovascular disease [2]. In addition, although psychological consequences such as anxiety and depression are common among individuals with cardiovascular disease particularly following sudden events such as a myocardial infarction (MI) or cardiac arrest, the literature examining the effective treatment of psychological illness following cardiovascular events remains limited.

Cardiovascular disease includes coronary heart disease (CHD), heart failure, valvular heart disease, rheumatic heart disease, congenital heart disease, cardiac arrhythmias, peripheral artery disease, aortic aneurysm, ischemic stroke, transient ischemic attack, intracerebral hemorrhage, and subarachnoid hemorrhage. Coronary heart disease predominates and this is reflected in the literature evaluating the epidemiology of cardiovascular disease. To date, numerous risk factors including smoking, obesity, hyperlipidemia, hypertension, and diabetes are associated with increased risk of CHD, and these risk factors are also present in other occlusive vascular disease such as stroke and peripheral vascular disease. In addition to lifestyle and genetic factors, psychological factors...
have also been found to contribute to cardiovascular disease [3]. Acute stress is associated with white-coat hypertension and acute coronary events whereas chronic stress is associated with established hypertension and CHD. In addition, individuals with pre-existing psychological illness such as depression are known to have an increased risk of coronary artery disease, whereas stress, anxiety, and hostility have been shown to predict atrial fibrillation [4].

The psychological consequences of cardiovascular disease are known to affect recovery and quality of life. Anxiety and depression are common consequences of sudden cardiac events associated with CHD and cardiac arrhythmia [5]. Furthermore, illness coping behaviors have a major influence on adherence to subsequent treatment and illness recovery [6]. Treatment of cardiovascular disease itself, particularly major surgery, implantation of cardiac defibrillators, and some side-effects of pharmacological therapy are also associated with adverse psychological effects [4]. This review article will summarize: psychological interventions that have been used as primary and secondary prophylaxis for cardiovascular disease in adults; and interventions to reduce the psychological morbidity associated with cardiovascular disease, with special attention to work that has been published in the preceding 18 months. Our primary focus will be cardiac disease, as we have excluded articles that have dealt solely with stroke. We had also excluded studies that evaluated educational, exercise and yoga interventions alone, but articles are included if they were conducted in combination with psychological interventions. The types of intervention evaluated are listed in Table 1.

### PRIMARY PREVENTION OF CARDIOVASCULAR DISEASE

#### Overall cardiovascular risk

Available evidence on the effectiveness of psychological interventions in reducing overall cardiovascular risk remains unclear. The Health Improvement...
<table>
<thead>
<tr>
<th>Authors/trial Acronym</th>
<th>Sample population</th>
<th>Sample size</th>
<th>Study design</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Limitations</th>
</tr>
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<tbody>
<tr>
<td>HARMONY [13**]</td>
<td>Unmedicated stage 1 hypertensive patients</td>
<td>101</td>
<td>Randomized wait list controlled</td>
<td>Mindfulness-based stress reduction within 4 weeks or after 12 weeks of diagnosis</td>
<td>No significant difference in ambulatory blood pressure measurements at 12 weeks</td>
<td>Potentially underpowered, as only able to detect differences of 6 mmHg or above</td>
</tr>
<tr>
<td>HART [12]</td>
<td>Heart failure</td>
<td>902</td>
<td>Randomized controlled study</td>
<td>Self-management (self-monitoring, environmental restructuring, elicitation of family support, cognitive restructuring) versus enhanced education</td>
<td>No significant difference in health related quality of life (QLI and SF-36) at 1 year</td>
<td>Unable to blind. Missing data not at random. Limited generalizability as performed in a single center</td>
</tr>
<tr>
<td>Keyserling et al. [18**]</td>
<td>Moderate to high cardiovascular risk attending family practices</td>
<td>385</td>
<td>Multicenter Randomized Trial</td>
<td>Individually tailored counseling using counselor or web-based decision aids</td>
<td>Web-based intervention programme equally effective at reducing Framingham Risk Score</td>
<td>Limited psychological component to the program, with the focus mainly on health education</td>
</tr>
<tr>
<td>McGillion et al. [11**]</td>
<td>Adults with CHD and Angina for at least 3 months</td>
<td>1282 (9 trials)</td>
<td>Systematic review of randomized controlled trials</td>
<td>Combination of cognitive and behavioral angina self-management techniques delivered to groups or individuals.</td>
<td>Improvement in angina frequency, physical limitation and depression scores</td>
<td>Heterogeneity and difficulty blinding</td>
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<td>ProActive Heart programme [20]</td>
<td>MI patients from two hospitals in Brisbane</td>
<td>430</td>
<td>Randomized controlled design</td>
<td>10 × 30 min scripted telephone delivered health counseling sessions over 6 months versus usual care (education)</td>
<td>Significant reduction in HADS-anxiety score and cardiovascular risk</td>
<td>Limited generalizability. Too costly.</td>
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<tr>
<td>Beating Heart Problems [21]</td>
<td>Patients admitted to two teaching hospitals with MI, or for cardiac revascularization</td>
<td>275</td>
<td>Randomized controlled study</td>
<td>Integrated motivational interviewing and cognitive behavioral therapy versus usual care-8 group models on physical activity, diet, adherence, smoking, depression, anxiety, anger, and social support</td>
<td>Reduced depression and anger, no differences in physiological, health behavior</td>
<td>Small sample size, multiple analyses, high attrition (25%) and poor compliance (60%)</td>
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in Prevention Study, evaluated a multicomponent intervention involving structured-risk assessment, lifestyle advice, motivational interviewing, and criteria-based referral to a lifestyle modification programme in 699 individuals aged 40–55 years with a diagnosis of hypertension and/or hyperlipidemia or aged 56–64 years with or without recorded risk factors and found no significant improvement with their intervention compared with conventional management [7]. The psychological component of individual intervention can be difficult to define, with many studies reporting education-based inventions as psychological interventions. For instance, a recent multicenter randomized controlled study in 385 individuals found to have moderate to high cardiovascular risk in family practices found that individually tailored counseling using a web-based decision aid was not inferior to counseling administered by a counselor in reducing oral Framingham risk score [18]. It is unclear in this study whether the contents of the interventions were solely educational or whether psychological components had been included. The use of internet-based interventions for the management of cardiovascular risks is increasing. A freely accessible internet-based Cognitive Behavioral Therapy (CBT) programme (E-couch) was found to have an effect on mild-to-moderate depression in participants with high cardiovascular risk [15]. Interestingly, pet ownership, particularly dog ownership has been associated with overall reduction in cardiovascular risk, but the body of evidence cannot be considered established, and there is no evidence that a new prescription of pet ownership can reduce cardiovascular risk. Furthermore, the psychological aspect of this relationship has not been dissected from the potential physical benefits [19].

**Hypertension**

The HARMONY randomized controlled study evaluated mindfulness-based stress reduction group therapy on blood pressure (BP) lowering among unmedicated individuals with stage 1 hypertension, and found no significant reduction in 24 h ambulatory BP between the group receiving immediate intervention compared with the wait list controlled group over a 12 week programme (Table 2) [11,12,13,18,20,21]. Neither were any differences in lifestyle nor anthropometric measurements found between the groups. Smaller studies on stress reduction interventions for BP lowering have yielded mixed results, with studies including medication management more likely to be positive than those that include only unmedicated individuals. This suggests that stress management strategies are
only effective when used concurrently with pharmacological therapy. Alternatively, individuals on pharmacotherapy are likely have more severe hypertension and hence, stress reduction may have a larger effect on individuals with more severe hypertension, whereas the unmedicated studies with likely milder hypertensive patients are underpowered to measure the smaller effects expected in this group of individuals. Large, multicenter studies comparing the BP-lowering effects of stress reduction should be conducted in individuals with different stages of hypertension to further evaluate this effect.

**Coronary heart disease**

A Cochrane systematic review evaluating psychological interventions in CHD found no significant improvements in overall mortality, revascularization, or nonfatal myocardial infarcts and only modest positive improvements in cardiac mortality [2]. The 'Beating Heart Problems' programme combined CBT and motivational interviewing to support the development of self-management skills in patients with recent acute MI or percutaneous and surgical intervention and reported a reduced risk of depression and anger but no difference in physiological measures or health behavior [22]. The Australian telephone delivered, social cognitive theory based, secondary prevention programme, ProActive Heart, demonstrated positive results across a range of outcomes including SF-36 scores, physical activity levels, BMI, alcohol consumption, and vegetable intake [8]. McGillion et al. [11**] published a systematic review of nine randomized controlled studies involving both individual or group cognitive and behavioral self-management techniques. They noted improvement in angina symptoms, physical limitation, and depression scores. In one of few Asian studies, Park et al. [23] found that an intervention combining education with health coaching showed promise with Korean patients but advised a future study with longer duration of follow-up.

The beneficial effects of psychological interventions in CHD are, therefore, mainly psychological in terms of reduction in depression with modest or limited benefits in cardiovascular risk and outcomes. Registered protocols of ongoing studies include the stress prevention intervention trial, which aims to reduce incidence of posttraumatic stress after MI using psychological counseling [14]. The psychodynamic motivation and training programme will evaluate the feasibility and effects of psychodynamic intervention for patients with stable CHD [17] whereas the ACTonHEART Study, will evaluate 'Acceptance and Commitment Therapy' based invention as a secondary prevention measure [16*].

**Heart failure**

A large randomized controlled study involving 902 patients from multiple hospitals from a single center, the HART study, compared a self-management programme involving self-monitoring, environmental restructuring, elicitation of family support, and cognitive restructuring with enhanced education [12]. There was an overall improvement in overall health-related quality of life but this improvement was observed for both groups and there was no difference between the groups. The authors argue that this suggests that the patients in the control group may have received a more active intervention than intended. The Buddy study evaluated the effectiveness of a peer support programme and found no benefit in hospitalization rate compared with specialist nurse management [10*]. Engagement with the peer support programme was poor, but a subsequent qualitative evaluation, conducted with a purposeful sample from the participants enrolled in the reciprocal peer support arm, found that individuals were more likely to engage with the programme if they connected with their peer, they found comfort in hearing others’ experiences, gained useful information and obtained practical tips in dealing with common issues associated with heart failure [10*]. Although anxiety and depression are common consequences of heart failure, few studies have evaluated specific psychological interventions to reduce adverse psychological outcomes in this group of patients. Heart failure patients appear to be underrepresented in this area of research and are arguably a group who could derive great benefit from interventions.

**Cardiac arrhythmias and implantable cardiac devices**

Although anxiety may both trigger arrhythmias as well as follow the onset of supraventricular arrhythmias, the role of psychological interventions in this area remains unclear. Most intervention studies in the area of arrhythmias have involved psychological interventions in individuals with implantable cardiac defibrillators (ICD). The incidence of anxiety and depression in patients with ICDs is higher than in other cardiac populations. Stress reduction and other psychological interventions are effective in reducing the psychological burden and improving quality of life among individuals with ICDs [24].
Psychiatry, medicine and the behavioral sciences

CHALLENGES AND CONSIDERATIONS
The identification and classification of psychological intervention studies is a major challenge due to the wide variety of interventions evaluated, which are sometimes not described in sufficient detail. In complex and multidimensional programmes, replication of the studies will be required but can be difficult, as it is hard to isolate the active components due to the possible synergistic effects of the interventions. Many studies reported psychological outcomes, but had not performed psychological interventions to influence these outcomes. In addition, studies that claimed to use psychological interventions may not necessarily have included psychological components. For instance, telephone-based consultations enquiring about clinical progress and offering clinical advice could be better classified as telemonitoring, as it fulfills the purpose of a clinic visit while removing the burden of travelling either on the part of the care deliverer or recipient. Although one may argue, that the phone call offers reassurance, this would not have been likely to be above and beyond the reassurance received had the telephone consultation been replaced by a clinic consultation [25]. Cost-effectiveness should also be considered, with one study concluding that the cost per QALY gained in the ProActive HEART program, was above acceptable limits compared with usual care [9]. In addition, many previous studies have included highly varied patient groups. More stringent patient selection directed specifically at those with obvious and persistent psychological-risk factors or symptoms should also be considered, as this variation may have explained the positive results of some studies [26].

CONCLUSION
The body of evidence on psychological interventions in the primary and secondary prevention of cardiovascular disease and the prevention of adverse psychological and disease outcomes is increasing. The most robust evidence remains in CHD and a number of studies have concentrated on ICD patients. The actual benefits of psychological interventions in all types of cardiovascular diseases, however, remains uncertain, with recent studies yielding mixed results, and available meta-analyses, suggesting limited or modest benefits. The large variety of psychological interventions and outcome measures available further adds to the difficulty in interpreting the results of current studies. Furthermore, many previous trials included a highly varied patient selection. Future studies should, therefore, consider a more focused approach including only those with obvious and persistent psychological factors.

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Conflicts of interest
There are no conflicts of interest to declare.

REFERENCES AND RECOMMENDED READING
Papers of particular interest, published within the annual period of review, have been highlighted as:
- of special interest
- of outstanding interest

10. Lockhart E, Foreman J, Mase R, Hesler M. Heart failure patients’ experiences of a self-management peer support program: A qualitative study. Heart Lung 2014; 43:292–298. Evaluates qualitatively individual experiences on participating in a peer support program, which was evaluated in a randomized controlled trial that reported last year.


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