Author's response to reviews

Title: Type D personality is associated with impaired psychological status and unhealthy lifestyle in Icelandic cardiac patients: A cross-sectional study.

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Author's response to reviews: see over
Dear Mr. Aldcroft,

Thank you for considering our paper for publication at the BMC Public Health. Please find enclosed a revised version of the manuscript titled: “Type D personality is associated with impaired psychological status and unhealthy lifestyle in Icelandic cardiac patients: A cross-sectional study”, with manuscript number MS: 1519068712443253. Our replies to the reviewers’ comments are included at the end of this letter.

We are very pleased to get the opportunity to improve our manuscript further and would like to thank the reviewers for their useful comments. We hope that this revised version of our manuscript now meets the high standards of BMC Public Health and look forward to learning of your decision in relation to our manuscript.

Yours sincerely,

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Responses to the comments of reviewer 1: Benjamin Chapman

1. Major comments

Comment #1: The public health significance of Type D is worth paying attention to from a population attributable risk perspective. Might the authors discuss the implications of these findings for prevention and intervention in cardiac-risk prone patients living in the community?

Response: Thank you for this excellent comment. We found this point very interesting and worthy of addressing in the paper, although little information is available regarding the population attributable risk of Type D personality. Thus, we have added a new paragraph to the discussion part of the manuscript, which can be seen below:

“Little is known about the population attributable risk Type D poses for CHD incidence in the community, as the main emphasizes in Type D research has not been to assert causal connection with CVD incidence, but rather to examine the association between general distress and prognosis in cardiovascular populations [17]. As a consequence, most studies on Type D personality and coronary heart disease have been conducted in cardiovascular samples. Yet, a number of general population studies on Type D personality have been conducted, and although they have not focused specifically on cardiovascular development or endpoints, they have exposed Type D personality as a vulnerability factor for adverse mental and physical health, such as worse health status, somatic health complaints and disease-promoting mechanism [62] and unhealthier lifestyle behaviors [22].” (Discussion, pg. 17-18)

Comment #2: An ongoing concern with Typological research in general is the issue of categorical vs. dimensional approaches. Reporting that 10 distinguishes Type D from non-Type D encounters the same difficulty of classifying diabetics as those above a cut-point on the continuous measurement of glucose levels--the goal standard is determined by the cut-point itself, rather than being able to find the cutpoint that maximizes sensitivity/specificity to a gold standard. Since people exist on a Type D continuum, I would encourage the authors to report secondary analyses with the continuous scale score--they could scale the continuous score by interquartile range or standard deviation units (see Harrell 2001 book on regression modeling) so that a 1 unit change represents the same sort of clinical meaningful metric they are probably trying to achieve with categorization. This will also enhance power.

Response: We are aware that the categorization approach used in the current study to define Type D personality has its shortcomings, but we believe that both dimensional and categorical approaches in personality research have their value. As Chapman and colleagues pointed out in
their paper from 2007, continuous and categorical measures are not necessarily mutually exclusive, but rather represent two different ways of capturing the psychological profiles of individuals (Chapman, Duberstein, & Lyness, 2007). The categorical approach in Type D personality captures a subgroup of people with similar personality profile, who all possess a certain and stable amount of general negative affect and inhibition in social interactions. These similarities in personality, if present in a certain amount, can cause them to react in a similar way once they receive a diagnosis of cardiovascular disease, which may again explain the adverse prognosis seen in this group. The categorization approach of Type D personality might fit very well into the clinical setting, as doctors and other health-care professionals are used to thinking with categorical framework (Denollet, Schiffer, & Spek, 2010). In this setting, the Type D personality construct could prove useful in identifying patients who have a higher risk of experiencing symptoms of psychological distress and adverse health-behaviors.

As with all categorizations, the use of a cut-off to define Type D personality has its disadvantages, but it is still far from arbitrary since its accuracy and validity have been tested. A recent study using item-response theory has shown the cut-off ≥10 on both subscales to be the best to distinguish between Type D and non-Type D individuals, as all items had the highest measurement accuracy around that cut-off (Emons, Meijer, & Denollet, 2007). We agree that the continuous approach could give added value in further research into the construct and assessment validity of the Type D personality construct, but believe that the categorical approach gives meaningful results for the current study, in identifying a group of patients at a higher risk of adverse psychological well-being and health-behaviors.

Comment #3: Type D may be such a powerful predictor because it encompasses both social inhibition and negative affectivity, and from a personality standpoint is a "compound trait". One gains increasing explanatory precision for effects if one can examine, in this case, the unique and shared predictive power of both subscales in order to determine if it is the negative affect, the social inhibition, or both elements that are important in these negative outcomes. I would suggest this secondary analysis in order to further pinpoint and comment on what exact aspects of Type D we should be most concerned about for given outcomes.

Response: We appreciate this suggestion, and have conducted a secondary analysis to test this idea for our predictions of anxiety, depression and stress scores, with the following results:

“A secondary analysis was conducted to test the unique and shared predictive power of both Type D subcomponents. The shared and unique explained variance of each factor was estimated from linear regression, where continuous NA and SI scores were included as predictors instead of Type D personality.” (Method, pg. 10)
“Secondary analysis of the unique and shared predictive power of both Type D subcomponents revealed that the association between Type D and anxiety is primarily driven by NA (31% of the variance), while the total variance explained by both factors was 34%. SI did not significantly contribute to the model. The shared variance of both factors was 2.5%. Conversely, both factors contributed to the association with depression and perceived stress, with 9% shared variance for both measures. The unique effect of NA was larger in both cases, with NA and SI explaining 9% vs. 4% of depression scores and 17% vs. 1% in perceived stress scores, respectively.” (Results, pg. 12)

“Secondary analysis revealed that the association between Type D and poor psychological status were to a certain extent driven by NA, but that SI had a significant unique contribution to both differences in depression and perceived stress scores. Both factors shared a considerable variance in depression and perceived stress scores, indicating the effect of Type D personality. These findings are in congruence with previous reports, where the interaction of NA and SI predicted increased stress levels [24].“ (Discussion, pg. 14)

It seems that Type D’s association with anxiety is primarily driven by NA, but that although NA has a larger unique explained variance for both depression and perceived stress, that SI has a significant contribution to the association, and that both factors have a considerable shared variance.

When we calculated the strength of the association between NA and SI with borderline/symptoms of anxiety, depression and heightened stress (with odds ratios), it was apparent that SI predicted adverse depression and stress levels, while NA was a significant predictor of all three measures. We did however not include these analyses in the manuscript, but here is a table showing the OR associated with NA, SI and Type D for the three measures. Of note, these calculations did not exclude outliers, as in the OR calculations reported in the paper, and thus the OR for Type D presented in this table are higher compared with the reported OR’s in the manuscript. Interestingly SI was the strongest predictor of depressive symptoms, but also had the widest confidence interval.

<table>
<thead>
<tr>
<th>OR</th>
<th>SI</th>
<th>NA</th>
<th>Type D</th>
</tr>
</thead>
<tbody>
<tr>
<td>anxiety</td>
<td><strong>1.04</strong> (1.00-1.09)</td>
<td><strong>1.21</strong> (1.15-1.29)</td>
<td><strong>3.35</strong> (1.79-6.26)</td>
</tr>
<tr>
<td>depression</td>
<td><strong>5.21</strong> (1.69-16.03)</td>
<td><strong>2.81</strong> (1.08-7.31)</td>
<td><strong>3.92</strong> (1.55-9.92)</td>
</tr>
<tr>
<td>stress</td>
<td><strong>3.58</strong> (1.92-6.70)</td>
<td><strong>6.48</strong> (3.31-12.67)</td>
<td><strong>6.59</strong> (3.48-12.48)</td>
</tr>
</tbody>
</table>
Comment #4: While the conclusions are well-put, one area that deserves further elaboration is how personality assessment can be feasibly integrated into health care systems, and how personality phenotype can complement genotyping in the coming area of personalized medicine.

Response: We thank the review for this insightful comment. We have now added changes to the paper, that address how the Type D personality could be feasibly used in the clinical setting. These changes include the following:

“Identification of Type D personality could be useful in many ways for usual cardiovascular health-care. It could help locate patients who have a 3-fold higher risk of poor prognosis or other adverse health-outcomes [17], or who may be less likely to follow their doctor’s recommendations regarding medications or changing unhealthy lifestyle behaviors. Type D personality has been associated with inadequate consultation behavior in heart failure patients [57, 58], lower medical adherence [59] and negative illness perception [60] in myocardial infarction patients. Rozanski [61] has argued that identification of psychological factors that might influence patient behavior and their adherence to behavioral change should encourage cardiologist to include a brief screening of such factors into their standard care. The DS14 is reliable quick to administer (2-3 minutes) and score [19], and could thus easily be incorporated into usual care. Subsequently, doctors could take Type D status into account when deciding on treatment for patients, especially when considering recommendations for strenuous lifestyle changes. Thus, Type D identification could help doctors provide a more tailored intervention for their patients.” (Discussion, pg. 17)

1. Minor comments:

Comment #1: The conceptual model wherein personality is the risk and psychiatric symptoms, behavior, etc. is clear; nevertheless the data are cross-sectional. Have the authors considered whether their data would feasibly support an instrumental variables approach to address this possible endogeneity (i.e., psychiatric symptoms causing personality ratings)? It can be difficult, however, to find reasonable instruments in the data for personality traits.

Response: We have considered the possibility of reverse causation as regards the status of Type D personality as a predictor of adverse psychological health, or vice versa, whether psychiatric symptoms cause a positive rating on Type D assessments. However, as numerous studies have demonstrated that Type D is an independent predictor of increased psychological distress, in longitudinal data and with some studies controlling for baseline measurements of other psychological factors (see Table 4 in Denollet, Schiffer & Spek, 2010), we believe we can assume that the association found in the current study is genuine. We have added a sentence to the limitation part of the discussion, to address this issue:
“In addition, the current findings regarding Type D and psychological status might be susceptible for reverse causation, due to the cross-sectional origin, but previous longitudinal reports demonstrating that Type D predicts onset, prevalence and severity of psychological distress after adjustments for baseline depression [17] diminish such a risk.” (Discussion, pg. 18)

Comment #2: The PSS actually does have cut scores to indicate high stress, so I would remove the sentence stating that it doesn't; the cut score may not be accurate in an Icelandic population because of all the issue involved in translating instruments, so the authors' use of the 75th percentile is still reasonable. Cohen S. & Williamson G.M. 1988 Perceived stress in a probability sample of the united states in S. Spacapan & S. Oskamp (Eds.) The social psychology of health, newburak park, CA, sage has cuts for different versions of the scale in the US.

Response: We were indeed not aware that there were cut-off scores available to indicate high stress for the PSS scale. We will delete this sentence from the method section, but keep our 75th percentile cut-off, as the reviewer correctly points out, American cut-offs might not generalize well to the Icelandic setting.

Comment #3: Can the authors comment on the prevalence of lower htn treatment in Type D? Jerant et al. 2010 Br J of Health Psyc found Neuroticism associated with lower pill-counts, so some speculation on whether this is compliance or lack of health care service use (which would seem less likely if the Icelandic system is easy to access and these patients are already in it) might be warranted.

Response: This is an interesting observation. There could be two factors at work here, concerning both the self-management of the patient, and how the patients are treated by the health-care system/doctors. It may very well be that doctors treat Type D patients in a different way or that Type D patients present themselves in a more passive way, which again could lead to a failure to notice their need for treatment/medication may escape the attention of the doctor. We also believe that Type D patients themselves may be less efficient in medication adherence and general self-management for their treatment. We have stated our point in this matter in the following way in the manuscript:

“The lower hypertension treatment prevalence is most likely due to the poorer self-management in Type D patients, as Type D has previously been associated with poor medication adherence [44]. Further evidence from normal population samples has also suggested that Type D individuals are less likely to seek appropriate medical care [45] or have regular medical check-ups [22].” (Discussion, pg. 15)
**Comment #4:** The lack of associations between Type D and dz severity may warrant an explanatory sentence for readers. I wonder if the sample represents a fairly uniformly advanced stage of severity, meaning there is too little variation to find an association.

**Response:** Thank you for this comment. We have now added the following two sentences to the discussion to clarify this finding.

“No association was found between Type D personality and disease severity. This finding is in accordance with previous results [40-42], and the notion that the adverse effects of Type D personality on cardiac prognosis are mediated through other pathways than disease severity, such as behavioral and physiological factors [13, 23, 24]. Studies on other psychological factors have yielded similar results, finding no association between various psychological factors and extent of coronary atherosclerosis [43].” (Discussion, pg. 15)

We do not believe that the current sample is homogeneous group, as the Landspitali-University Hospital is the only place that does coronary angiographies, and thus all patients in need of an angiography are referred to that hospital. Thus, the range of patients includes individuals sent for an angiography due to unclear angina symptoms to acute myocardial-infarction patients and preparations for coronary artery bypass graft surgeries. This is evident in Table 1 in the manuscript, where 10% of participants have unspecified chest pain/ or other symptoms and 11% of patients arrive to the hospital with acute myocardial infarctions.

2. Discretionary

**Comment #1:** First paragraph, "The association of Type D with anxiety, depression, etc." The df for the t-statistic for the depression association is quite different than that for anxiety and I am guessing reflects the corrected df for unequal variances b/w depressed and non-depressed (which would make sense)? Please double check.

**Response:** Indeed the variance for depression was unequal, and thus we used the df and t-static for unequal variances.
Responses to the comments of reviewer 2: Jerry Suls

**Comment:** This correlational study examines the associations of Type D with psychological distress and with health-relevant behaviors. Beyond finding associations in an understudied population (Iceland), I don’t think this study does not go very far. Type D is defined by combined scores on anxiety and social inhibition so it is scarcely surprising that Type D’s show greater distress. As for the health behaviors at 4-months, most of the associations seem consistent with the larger literature: depressed people smoke more and tend to either eat more (or eat less) than the non-depressed. I would agree with the authors that the results reinforce the need for greater attention to smoking cessation in post-ACS patients because it is probably the most toxic thing that they do. I could also be critical of the reliance on self-reported health behaviors (maybe the Type D’s are less defensive about admitting their mistakes), recall and measures with ambiguous labeling and temporal reference. In sum, I do not think this is strong research.

**Response:** We thank the review for this critical comment. The association between Type D personality and psychological distress is indeed to be expected, given the fact that Type D refers to an increased propensity towards psychological distress. We would like to state that the NA subcomponent of Type D is not just simply anxiety or depression. It refers to a stable and chronic tendency in individuals to experience general negative affect, which can cause distress over a long period of time, compared with the more temporary nature of psychological factors such as depression. Although there is overlap between the Type D with anxiety, depression and other negative affect constructs, it does distinct itself from them as well. Results from one study have demonstrated that depression and Type D represent two different kinds of emotional distress (Denollet et al., 2009), and longitudinal data have suggested that Type D predicts depression and anxiety independent of baseline depression levels (Denollet et al., 2010). The Type D construct is intended to represent and identify individuals with a broad and stable tendency towards general psychological distress, and the current findings give confirmation from this attribute in an understudied population, as the reviewer correctly points out.

Type D personality has also been shown to be an independent predictor of cardiac prognosis, when controlling for co-occurring levels of depression (Denollet et al., 2010), which indicates that Type D has something extra not entailed in other psychological factors and that its effects may be mediated through different pathways. Moreover, one study has shown that SI modulates the effect of negative emotions on cardiac prognosis (Denollet et al., 2006). This could be especially relevant when it comes to health-behaviors and medication adherence in cardiac patients. The social inhibition component may inhibit patients in their communication with their doctors. Furthermore, they might be less likely to participate in exercise programs recommended by doctors as their social inhibition might make it hard for them to join a larger group of people.
As regards the self-report of health-behaviors, we would argue that although self-reports of health-behaviors have certain limitations, they are not useless. The recent paper by Mommersteeg and colleagues in BMC Public Health has shown that patient self-reports of health-status predict prognosis in percutaneous coronary intervention patients (Mommersteeg, Kupper, & Denollet, 2010). Of course, detailed observational studies of diet, exercise, and other health-behaviors with diary registering, or other similar methods could provide better information, but these measures are costly and time-consuming in a large scale study such as ours. The current self-report measures give good first indication of how these patients are behaving shortly after an angiography, and could be useful to generate ideas for further studies which could be conducted with more detailed and thorough measurements.

References


