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What Do Coronary Artery Disease Patients Think About Their Treatments?

An Assessment of Patients' Treatment Representations

Authors:

Shashivadan P. Hirani, MSc

Health Psychology Unit, Centre for Behavioural and Social Sciences in Medicine, Division of Medicine, University College London, UK

David L.H. Patterson, MD

Clinical and Academic Department of Cardiovascular Medicine, The Whittington Hospital NHS Trust, London, UK

Stanton P. Newman*, DPhil

Health Psychology Unit, Centre for Behavioural and Social Sciences in Medicine, Division of Medicine, University College London, UK

*Corresponding Author

Health Psychology Unit, Centre for Behavioural and Social Sciences in Medicine, Division of Medicine, University College London, Wolfson Building, 48 Riding House Street, London W1N 8AA, UK.

e-mail: s.newman@ucl.ac.uk

Shashivadan Hirani is a Health Psychology Research Fellow at the UCL Centre for Behavioural and Social Sciences in Medicine. His research interests revolve around patients' beliefs concerning their illness and the treatments or rehabilitation that they receive.

David Patterson is Consultant Physician and Cardiologist at the Whittington Hospital and Vice Dean of the Royal Free and University College London Medical School. He has a special interest in community cardiology and medical informatics.

Stanton Newman is the Director of the UCL Centre for Behavioural and Social Sciences in Medicine and Professor of Health Psychology. He has a specialist interest in cardiovascular disease, outcomes of cardiac surgery and interventions to encourage patients' behaviour change.

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ABSTRACT

This paper investigates patients' beliefs about the intervention offered to manage their illness. Coronary artery disease (CAD) patients, 70 of whom were undergoing medication, 71 to undergo angioplasty and 73 to undergo surgery, completed a 58-item questionnaire regarding their treatment beliefs. Responses were subject to principal components analysis which indicated four factors accounting for 36.7% of the variance. After excluding extraneous items, the final questionnaire consisted of 27-items, clustered around four components: *treatment-value*, *treatment-concerns*, *decision-satisfaction* and *cure*. A coherent set of subscale inter-correlations and ANCOVAs examining treatment group differences on these sub-scales showed a logical, explicable pattern of group differences reflecting the distinctive natures of each treatment and demonstrated discriminant validity. Correlations with other scales provided evidence of construct validity.

Key words: treatment representations, coronary artery disease, principal components analysis, percutaneous transluminal angioplasty, coronary artery bypass surgery.

INTRODUCTION

Coronary artery disease (CAD) is a leading cause of mortality and morbidity in the developed world. It involves the narrowing or total occlusion of the arteries that provide oxygenated blood and nutrients to the cells of the heart as a result of plaques forming on the lining of the arteries by the atherosclerotic process. The symptoms typically include angina on exertion, shortness of breath, fatigue and sudden death. Patients face three main treatments to deal with coronary artery disease (CAD): medication, percutaneous transluminal angioplasty (PTCA) and coronary artery bypass grafting (CABG). In contrast to the acute revascularisation procedures of PTCA and CABG, medication is non invasive and continuous. All three treatments are typically accompanied by lipid lowering drugs to reduce the build up of the atherosclerotic plaques, together with aspirin or warfarin to thin the blood. Patients are also usually recommended to alter their diet, increase their exercise levels, and give up smoking. Although there are recommendations regarding which of these treatments should be used with different patients, there are no clear rules for clinical practice and in many cases the decision is driven by the clinician (Di Salvo, Paul, Lloyd-Jones, Smith, Villarreal-Levy et al., 1996).

While research concerning patients' beliefs about their illness (Leventhal, Meyer & Nerenz, 1980; Leventhal, Nerenz & Steele, 1984; Turk, Rudy & Salovey, 1986; Hampson, Glasgow & Toobert, 1990; Weinman, Petrie, Moss-Morris & Horne, 1996) and beliefs regarding medication (Horne & Weinman, 1999), have been the focus of a growing body of research, the investigation of more general treatment representations has been less far reaching (Horne, 1997). The self regulatory model (Leventhal et al., 1980; Leventhal et al., 1984) considers the importance of treatments for the illness through the cure/control component of illness representations and some researchers (Hampson, Glasgow & Strycker, 2000) have explicitly labelled this component as *treatment effectiveness.* However, within the self regulatory model, this component effectively considers whether there is a possible cure or a means by which to control the illness. It does not examine cognitions regarding the nature of the treatment.

Although they are likely to be related, treatment representations are clearly qualitatively different from illness representations. For example, the aims of treatment are often to eliminate or control disease, thus patient beliefs regarding these elements of the treatment are likely to impact upon their beliefs regarding the duration of the illness (i.e. time-line) and cure/control beliefs. Leventhal et al. (1997) suggest that procedures (treatments) may be viewed in terms of the same dimensions as those for IR, because the treatments are designed to counteract the illness. For instance, painkillers may have the five attributes of: time for effectiveness (e.g. the benefits of my treatment take a while to become apparent); consequences (e.g. my treatment produces many side-effects); cure/control (e.g. my treatment will cure my illness; my doctor made the decision concerning the type of treatment I should undergo); identity with regards to symptoms and illness targets (e.g. my treatment will return me to my normal life); and causal (e.g. my treatment is a very technical procedure). Additionally, Horne, Weinman and Hankins (1999) have attempted to formalise through factor analytic means the structure of medication beliefs. Within the Beliefs about Medicines Questionnaire they examine *specific* medication beliefs and *general* medication beliefs. Their structures comprised four factors examining the necessity of prescribed medication (specific-necessity); the danger of dependence, toxicity and disruptiveness of medication (specific-concerns); the harmful, addictive, poisonous nature of medications (general-harm); and the overuse and excessive prescription of medications by health professionals (general-overuse). It is clear from these sub-scales that the BMQ specifically focuses on medication rather than other medical treatments such as surgery.

Other research conducted on treatment representations has predominately been qualitative in nature which although indicating important constructs of treatment representations, does not lend itself to quantitative comparisons between treatment groups or to establishing the strength of relationship between treatment variables and pertinent health related cognition or behaviours (see also Horne &

Weinman, 1998). There has also been a particular focus on treatment for psychiatric illnesses, the doctor-patient relationship or the psychotherapeutic process (Bowden, Schoenfeld & Adams, 1980; Eisler, Hersen, Miller & Wooten, 1973; Kampman, Lehtinen, Lassila, Leinonen, Poutanen & Koivisto, 2000; Mcevoy, Apperson, Appelbaum, Ortlip, Brecosky, Hammill et al., 1989; Pipes, Schwarz & Crouch, 1985; Whittle, 1996; Wilkinson & Williams, 1986). Such process variables are less central to the treatment of physical conditions such as CAD, where the nature of the treatments in terms of the physical and emotional trauma is more important for outcomes. The work is often limited and concentrated on treatment efficacy and expectations (Eisler et al., 1973; Kampman et al., 2000; Whittle, 1996), which may be considered only one element of a complex treatment representations framework. Alternatively they focus on pharmacological preparations (e.g. Kampman et al., 2000; Horne, Weinman & Hankins, 1999; Marteau, 1990), which for many chronic conditions is only one of a number of differing types of interventions available. Beliefs concerning one-off treatments such as surgery, angioplasty or other invasive procedures will not be adequately assessed by a measure devoted to beliefs about medication. Despite limitations, this research has highlighted the important role of treatment representations and their relationship to health related behaviours (e.g. functioning, adherence). While the process of defining the underlying structure of treatment representations has made progress (Horne, 1997), further work is required in order to understand treatment cognition in conditions where there are multiple avenues of treatment that extend beyond pharmacological preparations.

The radically different natures of the treatments for CAD provide an opportunity to investigate treatment representation in a systematic manner in the same underlying condition. This study was designed to assess whether individuals with CAD developed systematic and coherent cognitive representations of their treatment and specifically whether the three radically different forms of treatment (medication vs. PTCA vs. CABG) lead to differences in treatment representations. To investigate CAD patients treatment beliefs, this study developed a treatment representation questionnaire based on dimensions

and issues suggested in previous research; and evaluated whether the produced sub-scales could discriminate between treatment groups and show construct validity through their correlations with other health cognition scales and measures of emotion.

METHOD

Participants

Two hundred and ninety four patients with CAD were approached after a review by their cardiologist that determined the form of treatment they were to undergo. The clinician determined whether the patients were to start/continue medication or undergo revascularisation by PTCA or CABG surgery. Of these 214 (72.79%) consented to take part in the study. The response rate by treatment was similar, with 73% of those about to undergo CABG, 75% of those about to undergo PTCA and 71% of those to receive medication consenting; with the resulting sample consisting of 70 in receipt of medication, 71 to receive PTCA and 73 to receive CABG surgery.

Instrumentation

Treatment representation measure

An initial Treatments Representations Inventory (TRI) was designed specifically for this study. Following a review of the relevant literature, seven areas were identified from which items were generated. These were:

- expectancies of outcome (e.g. relief of symptoms, return to normal life)
- treatment information and decisions (e.g. decision satisfaction, level of information provided)
- necessity of treatment (e.g. life impossible or be very ill without it)
- possible complications and side effects
- emotional concerns regarding the treatment (e.g. anxiety, worry)
- time scales for improvements

- changes required in personal behaviour and lifestyle (e.g. dietary changes, increase in exercise).

A pool of items referring to treatment in general, rather than specific procedures, was compiled through: amending appropriate items from existing measures, where they overlapped with the above categories e.g. from the BMQ (Horne et al., 1999) or the ANT (Bowden et al., 1980; Kampman et al., 2000); insights from previous research interviews; and composing items where none were available. These items were subjected to a pilot study to identify ambiguous or poorly worded statements and to discover if any issues remained unaddressed. Appropriate changes were implemented. Respondents were asked to rate their level of agreement with each statement on a 5-point Likert scale, scored from 1 (strongly agree) through to 5 (strongly disagree). The TRI which the patients completed consisted of 58 statements with both negatively and positively worded.

Cardiac symptoms, disease measures and co-morbidities

Information on CAD severity was obtained from angina and breathlessness ratings adapted from Feinstein, Fisher & Pigeon (1989), and provided scores relating to the level of functional impairment resultant from each of these symptom, obtained over the dimensions of task, pace and daily function. Scores, representing mean item ratings, range from 0-4, with higher scores representing greater limitations.

Angina, breathlessness and fatigue frequency were assessed through three items asking patients the frequency with which they experienced chest pain, shortness of breath and fatigue. Responses were recorded on 4-point scales, (higher scores represented greater frequency), following the format of the Illness Perceptions Questionnaire (IPQ) identity component measure (Weinman et al., 1996).

An objective measure of disease severity was obtained from patient angiograms. These provided information on the number of diseased arteries, left ventricular function and the level of disease in three coronary disease prone arteries: the left anterior descending, the circumflex, and right coronary artery. Ventricular functioning and arterial levels of disease were agreed upon and rated on a four point scale (no significant disease, mild, moderate or severe) by two cardiologists. These four scores and the number of diseased arteries were summed to provide a disease severity score, ranging from 0-15.

Information was collected on other common co-morbid physical conditions and risk factors for CAD (hypertension, diabetes, hypercholesterolemia). Additional information concerning previous MI, previous cardiac interventions and family history of illness was also recorded.

Emotion and health cognition measures

Emotional states were assessed using the Center for Epidemiologic Studies Depression scale, CES-D (Radloff, 1977); a 6-item short form of the Spielberger State-Trait Anxiety Inventory, STAI-6; (Marteau & Bekker, 1992); and the Positive and Negative Affect Schedule, PANAS (Watson, Clark & Tellegen, 1988). Health related cognitions were measured using the Illness Perceptions Questionnaire (IPQ) timeline, consequences and cure/control scales (Weinman et al., 1996); the Recovery Locus of Control scale, RLOC (Partridge & Johnston, 1989); and Acceptance of Illness scale, AIS (Felton, Revenson & Hinrichsen, 1984).

Statistical analyses

The SPSS for Windows (v11.1), SAS (v8.2) and NORM (Schafer, 2000) statistical software packages were used for the statistical analyses. The analyses conducted and methods utilised were:

Missing value analysis and multiple imputation

Five imputed datasets were generated to deal with missing data. In analyses containing variables with >5% missing data, multiple imputation procedures were used on the imputed datasets (Little & Rubin, 2002; Allison, 2001). When variables had <5% missing data, the first imputed dataset was utilised.

Factor analysis, scale reliability and scale scores

The treatment questionnaire responses were subjected to principal components analysis (PCA) with oblique rotation. The factor analysis served (i) to investigate the latent component structure of the questionnaire and (ii) as a mechanism of data reduction to refine the measurement of these components. This set of data was initially examined by means of Bartlett's Test of Sphericity (BTS) and the Kaiser-Meyer-Olkin (KMO) index measure of sampling adequacy (MSA) to evaluate whether individual items should remain in the analysis. To maximise the MSA, an anti-image correlation was generated and the measure of MSA on the major diagonal was examined for individual items. Items with MSA<0.6 were removed from the analysis and the matrix regenerated. This process was repeated until all items had a MSA>0.6. The remaining items were employed in the PCA. A scree plot was utilised to determine the number of factors extracted. Items loading above 0.500 in the final matrix were retained in the factor solution for scale development.

The internal reliability of sub-scales produced through the PCA was assessed using Cronbach's alpha statistic. Individual items' contribution to the reliability index and their removal statistics were examined. Items were to be removed until no further valid increment in reliability was achievable. For each participant, sub-scale scores were calculated based on mean-item scores, and ranged from 1 to 5.

Correlations

Relationships between variables were examined using Pearson's r statistic, with correlations considered significant at the $p<0.01$ level.

Treatment group differences: chi-square and ANOVA / ANCOVA

Differences between treatment groups on demographic and medical data were ascertained through a series of one-way ANOVA's with post hoc tests (Brown-Forsythe adjustment implemented where necessary; post hoc Tukey-Kramer test for equal variances and Dunnett's-T3 for unequal variances) were performed on continuous data and χ^2 test on categorical data. Cardiac and demographic variables that were significantly different between treatment groups were utilised as covariates in a series of ANCOVAs to assess treatment group effects on factors of the TRI. Where a significant overall model was found, group mean differences were tested for significance. Significance levels for p values were set at 0.01, and measures of the strength of association between variables are provided through Omega-squared (ω^2) and Cramer's Phi (ϕ_c), where appropriate. ($\omega^2 \approx 0.01$ is a small association, $\omega^2 \approx 0.06$ is a medium association, $\omega^2 \approx 0.14$ is a large association; $\phi_c < 0.3$ indicates little/no association, ϕ_c from 0.3 to 0.7 indicates a weak association, and ϕ_c from 0.7 to 1.0 is a strong association).

RESULTS

Missing value analysis and multiple imputation

The overall missing data level for variables was low at 1.64% (140 scores from 8560); nevertheless, sixty-four (29.9%) cases had incomplete data, which would result in the deletion of 48 (22.4%) cases in each ANCOVA. Although the overall level of missing data is low, its effects can be relatively large. Consequently, imputation methods (single and multiple) were implemented where necessary.

Treatment group differences: preliminary analyses

Demographic variables

The sample consisted of 175 males and 39 females, with similar proportions of males and females in each of the treatment groups (CABG: 66 males, 7 females; PTCA: 57 males, 14 females; medication:

52 males, 18 females; χ^2=6.934, df=2, p=0.041; ϕ_c=0.173). The mean age of the sample was 64.09 years, with no age differences between the treatment groups ($f_{(2,213)}$=2.588, p=0.078; ω^2=0.015). Many patients were retired (61.7%), but these proportions were not significantly different between groups (CABG: 41 retired, PTCA: 38, medication: 53; χ^2=8.773, df=2, p=0.012; ϕ_c=0.202). The treatment groups differed significantly on education level (measured on 4-point scale: 1 – no formal education to 4 – graduate/professional exams and above), Brown-Forsythe: $f_{(2,202)}$=9.890, p<0.001; ω^2=0.077, with the PTCA participants (mean=2.48, se=0.150) significantly more educated than the CABG (mean=1.64, se=0.116) and medication (mean=1.97, se=0.135) patients. This was reflected in the numbers of PTCA graduates/postgraduates and their lower numbers without formal education.

Co-morbidity and cardiac risk factors data

Treatment groups were similar with regards co-morbidity and cardiac risk factors (see Table 1). Two significant differences between treatment groups were previous cerebral events (χ^2=10.526, df=2, p=0.005; ϕ_c=0.222) and previous cardiac interventions (χ^2=27.779, df=2, p<0.001; ϕ_c=0.360).

INSERT TABLE 1 ABOUT HERE

Symptoms and angiograms

One-way ANOVAs of functional limitations ratings for angina and breathlessness indicated significant differences between treatment groups for angina functional limitations (combined parameter: $f_{(2,2762)}$=8.824, p<0.001; ω^2=0.070). Post-hoc tests showed the medication group (mean=1.31, se=0.151) was significantly less functionally impaired on the angina scale than both the PTCA (mean=1.96, se=0.149) and CABG (mean=2.16, se=0.145) patients. Differences on breathlessness functional limitations were not significant (combined parameter: $f_{(2,691)}$=3.793, p=0.023; ω^2=0.028; medication mean=1.57, PTCA mean=1.66, CABG mean=1.80).

Angina frequency produced a significant group effect ($f_{(2,211)}$=5.444, p=0.005; ω^2=0.040), with the medication group (mean=1.80, se=0.087) significantly lower than the PTCA (mean=2.18, se=0.087) group; however no differences were found from the CABG group (mean=2.11, se=0.086). Breathlessness frequency ($f_{(2,211)}$=1.562, p=0.212, ω^2=0.005; medication mean=2.19, PTCA mean=2.37, CABG mean=2.11), and fatigue frequency ($f_{(2,211)}$=2.864, p=0.061, ω^2=0.012; medication mean=2.23, PTCA mean=2.56, CABG mean=2.36) did not demonstrate significant group differences.

The angiogram score showed significant group differences with a large treatment effect ($f_{(2,2418)}$=29.814, p<0.001; ω^2=0.214). Post hoc tests revealed the CABG group (mean=10.89; se=0.331) to have a significantly higher score compared to the PTCA (mean=8.28; se=0.322) and medication (mean=7.51; se=0.333) groups.

Correlations within the five subjective symptom measures (frequency and functional limitations), ranged from $\pm$ 0.383 to 0.727 (r^2 from 0.147 to 0.529), and were all significant at the 0.01 level. However, they were not of a magnitude (i.e. above 0.80) that indicated a composite score should be devised. The relationships between subjective symptom measures and the objective measure of disease status were not significant (correlations ranged from 0.009 to 0.104, p>0.01, r^2 from 0.00008 to 0.011) and were of a much lower magnitude than those within subjective measures. It is not uncommon to find little relationship between physical measures of disease and symptoms, except at the extremes (de Bono, 1999).

Factor analysis, scale reliability and scale scores

At the start of the FA procedures, the item-participant ratio was $\approx$ 1:4. The first AICM produced, an unsatisfactory MSA for a seven items (BTS: approx. χ^2=4651.216, df=1653, p<0.001; KMO=0.772);

these were removed and another AICM generated. The second matrix comprised items with KMO>0.6 and produced satisfactory statistics for BTS (approx. χ^2=3964.760, df=1275, p<0.001) and KMO=0.809. The scree plot indicated a four-factor solution and PCA produced a factor structure that accounted for 36.7% of the variance (see Table 2). Two items loaded onto 2 factors >0.50, in each case the item was retained in the factor on which it had the highest loading. Twenty-three items were hyperplane (no loadings >0.50). The four factors were labelled (i) treatment value (16.0% of variance, Eigen value=5.157), (ii) treatment concerns (11.0%, Eigen value=5.624), (iii) decision satisfaction (5.9%, Eigen value=6.045), and (iv) cure (3.8%, Eigen value=4.422). The items loading significantly onto each factor were employed (unweighted) to generate sub-scale scores for each participant. However, one item in the cure component did not have face validity for its construct, (i.e. 'my treatment is the main thing on my mind at the moment') and was excluded from sub-scale value calculations.

Cronbach's alpha for each sub-scale was: treatment value - 0.788 (7-items), treatment concerns – 0.773 (7-items), decision satisfaction – 0.798 (8-items) and cure – 0.747 (5-items). Removal of items did not raise the internal reliability of the sub-scales.

INSERT TABLE 2 ABOUT HERE

Treatment Representations Inventory scale scores analyses

INSERT FIGURE 1 ABOUT HERE

Treatment group differences

Adjusted-mean scale scores on each factor by treatment group are presented in Figure 1, scores of neither agree or disagree (i.e. 3) are taken as the reference value.

To assess the ability of the TRI sub-scales to discriminate between treatment groups in a logical manner, ANCOVAs controlling for differences in educational level, cerebral events, angina symptom reports, objective measures of disease (angiogram score) and previous interventions were conducted. Significant effects were found for each factor TRI: treatment value: $f_{(8, 103331)}$=4.026, p<0.001, ω^2=0.031; treatment concerns: $f_{(8, 156666)}$=3.151, p=0.001, ω^2=0.027; decision satisfaction: $f_{(8, 70553)}$=4.581, p<0.001, ω^2=0.053; and cure: $f_{(8, 114293)}$=15.9661, p<0.001, ω^2=0.301. (The large denominator degrees of freedom reflect the missing information in each analysis). For each ANCOVA, the only variable (parameters) that contributed significantly towards the significant model was treatment group (p<0.01). Homogeneity of variance was maintained for each analysis, and tests for the equivalent slopes assumption in each ANCOVA was insignificant for covariates tested as a group and individually (p>0.01). Significant group differences on each TRI sub-scale as revealed through post-hoc tests of are shown in Figure 1.

INSERT TABLE 3 ABOUT HERE

TRI scales construct validity

Correlations between the four TRI sub-scales and with scales employed for construct validity are presented in Table 3.

DISCUSSION

The analysis revealed 4 factors to treatment beliefs in CAD - *treatment value*, (benefits of treatment in controlling and arresting CAD); *treatment concerns* (anxiety and worry about the treatment); *decision satisfaction* (satisfaction with and suitability of treatment chosen) and *cure* (ability of treatment to

remove the disease). The number of initial items was reduced to produce a final questionnaire of 27 items, (available on request from the corresponding author).

The findings suggest that although illness and treatment may be related, they do not share a similar structure; although a degree of overlap was found on two factors. The cure component and to a limited degree the treatment value component of the TRI, being similar to comparable factors within IR. Decision satisfaction correlated with IPQ cure/control beliefs, indicating the more satisfied with their treatment patients were, the greater control and possibility of cure they perceived regarding the illness. Logically, TRI cure was negatively associated with the IPQ time-line. The treatment concerns sub-scale was correlated with the IPQ consequences scale. Concerns regarding treatment may be reflected in the increased likelihood of more severe perceived consequences of the illness.

The limited correspondence between the TRI and analogous items with the Belief in Medicines Questionnaire (Horne et al., 1999) was consistent with the concepts of the subscales. The treatment value sub-scale and BMQ necessity scale both reflect how the treatment is essential for long-term control of the disease. Similarly, the treatment concerns sub-scale and the BMQ concerns scale both address the emotional unease patients have regarding their treatment. As the TRI is concerned with treatments in general and not simply medications the findings suggest that the ability of a treatment/medication to manage the illness and the emotional concerns regarding medication/treatment are important representations of both medications and other treatments. The remaining subscales of the TRI (decision satisfaction and cure) are different to those found in the BMQ (overuse and harm). This probably reflects the different contexts for which the questionnaires were developed (i.e. pharmacological treatment vs. general medical and surgical procedures) with the BMQ scale more focused towards adherence. The TRI therefore can be considered more applicable to a range of medical and surgical interventions rather than reflecting solely medication beliefs.

The validity of the TRI sub-scales is supported by the subscale correlations with those in the IPQ & BMQ. Its validity was also assessed by examining correlation within the TRI subscales. The more a treatment is valued, the greater the satisfaction with the treatment decision was reflected in the high correlation between treatment value and decision satisfaction sub-scales Further, the high treatment value scores were related to high cure scores, although the limited correlation is likely to reflect the difference between these concepts with cure reflecting somewhat more optimistic beliefs than treatment value. A triad of relationships between these variables is complete with the significant correlation between the decision satisfaction and cure sub-scales; patients satisfied with their course of treatment are also likely to be those that are most optimistic with regards to the treatment affecting a cure. The correlation between the treatment concerns and decision satisfaction sub-scale indicated that the greater dissatisfaction with the treatment decision patients is associated with more concerns regarding treatment.. The lack of correlations between treatment concerns and the remaining scales may indicate that the negative (emotional aspects) and positive (cure and control) aspects of a treatment are independent, in a similar fashion to negative and positive affect; see Watson et al. (1988). Thus, although patients may be worried about the treatment, they may also value the treatment and be optimistic regarding their expectancies from the treatment.

The sub-scales also demonstrated coherent correlations with other cognitive and emotional scales to provide further evidence of construct validity. For example, the treatment value sub-scale positively correlated with other control orientated scales, i.e. RLOC and IPQ cure/control. The more patients value a treatments ability to control their disease process, the greater the sense of control over the illness that is perceived. The value of the treatment in controlling disease progress was also correlated with positive affect but not with negative emotions. The treatment concerns sub-scale was significantly correlated to all measures of negative mood (anxiety, depression and negative affect) providing support

for its ability to capture the negative affect experienced in relation to the treatments. The smaller negative correlation with the PANAS-PA scale and the large negative correlation with the AIS scale, which measures the ability to accept illness without feeling negative emotions, also support the construct validity of this factor. It appears that the emotional facets of the treatment are captured solely within the treatment concerns sub-scale, as there was a lack of significant correlations between the other TRI sub-scales and the CES-D, STAI-6 and PANAS-NA scales.

Further support to the validity of the sub-scale scoresto discriminate between the three treatments. The different perceived goals of the treatments appear to lead to differing levels of optimism with regards to cure. The medication group was equivocal regarding cure while the interventional groups produced scores that indicate that they believe their treatments offer the possibility of a cure. The strongest beliefs in cure came from the most invasive and dramatic treatment (CABG). In contrast to the medication group, the interventional groups received treatments which deal with the cause of their symptoms (i.e. overcoming arterial blockages) and with removal of these appear more likely to believe in a cure. In the case of PTCA this is tempered by the high restenosis rates; a more circumspect attitude is evident in medication patients who may believe the cause of their CAD, the arterial blockages, still remains even with treatment.

The high overall value for all the treatments (see Figure 1) are not surprising, given that most patients would anticipate benefits from their treatments. The PTCA group which had the lowest score on this dimension, is likely to have been informed of the relatively high re-stenosis rate in PTCA (de Bono, 1999) which may have attenuated their scores on the sub-scale. The medication patients' scores on this dimension were not significantly different from either of the interventional groups perhaps reflecting the fact that advice to continue the treatment confirms its value.

An alternative and complementary process that may also affect the scores on the cure and value components may be the more complex and intrusive natures of the surgical and angioplasty interventions, which leads to an affect akin to the placebo effect (Beecher, 2003). Due to the greater drama of the interventions, patients may have greater faith and value in their abilities to control and cure the CAD. This is reflected in the medication groups low score on the treatment concerns sub-scale in contrast to both the other invasive procedures. The logical hierarchy of scores in relation to invasiveness of the treatment procedures provides further validity for the sub-scale in addition to the scale's correlations with mood scales. However although occupying a midpoint between the two other treatments, the PTCA group did not differ significantly from the two other groups. Given the more dramatic nature of the CABG procedure relative to PTCA and likewise between the PTCA and medication group, significantly greater treatment concerns may have been expected for the more invasive treatments. This may reflect that many of the patients may have had the opportunity to resolve any informational needs or the low overall scale scores on this dimension, which in themselves may be a function of the high levels of satisfaction with the treatment decisions.

All the groups were relatively satisfied with the decision on treatment but again there was a hierarchy with the CABG group was significantly more satisfied than the medication group and the PTCA group occupying a midway position. The sub-scale scores indicate that revascularisation treatment is preferred; with the CABG treatment apparently seen by CAD patients as the definitive form of treatment for CAD and the most preferred treatment. The position of the PTCA group shows that it is the next preferred option. The medication group is last in the hierarchy, although it is by no means dismissed as an ineffective treatment. These findings coupled with the fact that the CABG group appeared to place more value on and perceive likelihood of a cure from their treatment suggests that CABG is indeed perceived as the definitive treatment for CAD. Patients with CAD may also believe that they all will eventually undergo surgery and that both medication and PTCA are just interim treatments.

In summary, this study examined the treatment beliefs of three groups of CAD patients, undergoing medication, PTCA or CABG treatment. The PCA of these beliefs produced a four factor solution that revealed a coherent set of relationships between the components. The treatment group differences on these sub-scales showed a logical and explainable pattern of group differences, which reflected the distinctive and hierarchical natures of each treatment. Additionally, the TRI sub-scale inter-correlations and correlations with health-related cognition and mood scales provide evidence of their concurrent validity. The aggregated results of the analyses (correlations, the sub-scale scores and treatment group differences) indicate a structure for treatment beliefs that is valid and statistically reliable, and provides validity to the TRI questionnaire.

The TRI questionnaire offers an easy way for health professionals to assess patients' views of their treatment. This may be used to inform interventions prior to treatment (e.g. aimed at reducing patients' anxiety); to identify contradictions in patient beliefs which may influence adherence and recovery; to tailor information about the treatment; and to add a patient perspective to the decision-making process. The questionnaire may also be useful to investigate the relationship between treatment cognitions and cultural beliefs that may affect the efficacy of treatment.

In order to validate further the questionnaire developed, it is important to replicate the stability of this structure with a range of treatments, both within and beyond coronary artery disease. It is also important to establish how these belief levels may change over time with regards to discrete treatment events and how beliefs concerning continuous treatments, such as medication, may evolve over time. This needs to be done in conjunction with further examination of how treatment beliefs are related to other important health related cognitions how they impact upon a number of health related behaviours and recovery indices.

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Table 1: Co morbidity and cardiac risk factors within the three treatment groups.

		Medication	Angioplasty	Surgery	
		70	71	73	P
Arthritis/rheumatism		32	24	29	0.352
Respiratory disease		13	15	16	0.876
Renal complications		0	0	1	0.379
Cerebral Events		12	7	1	0.005*
Gastro-Intestinal Tract Problems		29	24	20	0.209
Peripheral Vascular disease		7	7	6	0.920
Thyroid Problems		3	5	1	0.237
Varicose Veins		14	9	17	0.249
Previous Myocardial Infarction		33	31	37	0.700
Previous cardiac Interventions (e.g. PTCA, CABG)		4	25	6	<0.001*
Hypercholesterolemia		45	40	31	0.029
Hypertension		36	24	22	0.021
Diabetes		11	10	13	0.829
Smoking History	Never Smoked	10	3	7	0.139
	Ex-smoker	43	42	51	
	Still Smoking	17	25	15	
Family History	Ischemic Heart Disease	49	45	47	0.503
	Myocardial Infarction	42	44	43	0.474
	Strokes	24	25	23	0.889
	Neurological	7	8	7	0.825

*$p<0.01$, χ^2 test

Table 2: Summary factor structure matrix for the treatment representations inventory.

	Component			
	1	2	3	4
	TREATMENT VALUE	TREATMENT CONCERNS	DECISION SATISFACTION	CURE
My health in the future depends on my treatment	**0.754**	-0.013	-0.269	-0.153
My treatment will bring my illness under control	**0.655**	-0.051	-0.457	-0.106
The treatment I will be given will determine the state of my health	**0.651**	-0.022	-0.055	-0.089
My treatment will increase my life span/longevity	**0.607**	-0.147	-0.309	-0.230
Without my treatment I would be very ill	**0.572**	0.182	-0.032	-0.099
The benefits of my treatment will last a long time	**0.535**	-0.116	-0.278	-0.224
My treatment will protect my illness from becoming worse	**0.501**	-0.044	-0.243	-0.258
Undergoing my treatment worries me	-0.042	**0.657**	0.070	-0.295
When I think of my treatment I feel anxious	-0.009	**0.619**	0.048	-0.347
I worry about the psychological side effect of my treatment	0.010	**0.601**	**~~0.533~~**	-0.029
My treatment will produce many psychological side effects	-0.003	**0.598**	0.163	0.062
I worry about the physical side effects of the treatment	0.116	**0.582**	0.401	-0.098
I worry about the long term effects of my treatment	0.149	**0.548**	**~~0.524~~**	0.059
My treatment may lead to many medical complications	0.006	**0.513**	0.239	0.118
I am satisfied with the particular treatment I am to receive	0.309	-0.202	**-0.682**	-0.003
I fully understand what the treatment entails	0.195	-0.138	**-0.613**	-0.135
I am satisfied with how the decision about the type of treatment I should undergo was made	0.377	-0.148	**-0.609**	-0.146
I received sufficient information about the options available to deal with my illness	0.081	-0.056	**-0.557**	-0.180
I would prefer to undergo more diagnostic tests than I have done / am scheduled To take	-0.176	-0.071	**0.556**	0.199
The treatment I am to receive is well 'tried and tested'	0.486	-0.108	**-0.554**	-0.208
I believe the treatment I am to receive is the treatment of choice for my condition	0.381	-0.082	**-0.539**	-0.364
The discomfort and effects of my treatment will be worthwhile given the benefits I am going to receive from it	0.459	-0.008	**-0.501**	-0.102
The treatment will cure my illness	0.088	0.169	-0.266	**-0.709**
I believe my treatment will return me to my normal life (i.e. As it was before my illness)	0.211	-0.063	-0.252	**-0.695**
My treatment will last a short time	-0.144	-0.064	-0.366	**-0.600**
My treatment is the main thing on my mind at the moment	0.254	0.415	0.081	**-0.569**
I am certain that my condition will improve due to my treatment	0.393	-0.135	-0.251	**-0.562**
I expect my treatment to have major benefits for me	0.410	-0.009	-0.268	**-0.510**

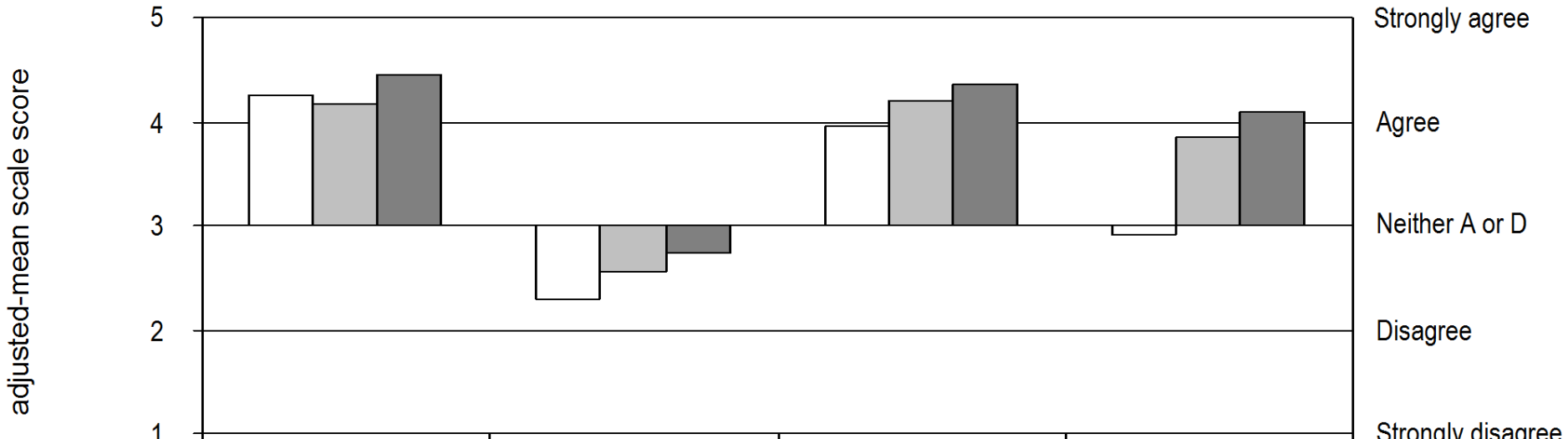
Table 3: TRI sub-scale correlations and correlations with other illness related scales

	Treatment value	Treatment concerns	Decision Satisfaction	Disease Cure
TRI Treatment Concerns	-0.048	-	-	-
TRI Decision Satisfaction	0.497 *	-0.247 *	-	-
TRI Disease Cure	0.348 *	0.011	0.434 *	-
IPQ Timeline	-0.161	0.079	-0.171	-0.598 *
IPQ Consequences	0.074	0.451 *	-0.127	-0.112
IPQ Cure / Control	0.385 *	0.015	0.338 *	0.606 *
Recovery Locus of Control	0.187 *	-0.108	0.124	0.161
Acceptance of Illness (AIS)	-0.058	-0.406 *	0.012	0.022
Positive Affect (PANAS – PA)	0.195 *	-0.259 *	0.088	0.128
Negative Affect (PANAS – NA)	0.099	0.478 *	0.010	0.041
Depression (CES-D)	-0.087	0.399 *	-0.092	-0.111
State Anxiety (STAI-6)	-0.049	0.527 *	-0.047	-0.037

*p <0.01, Pearson's correlation coefficients

IPQ – Illness Perceptions Questionnaire; PANAS – Positive and Negative Affect Schedule; CES-D – Centre for Epidemiological Studies Depression scale; STAI-6 – Speilberger Trait-State Anxiety Inventory – 6 item state scale

Figure 1: Covariate adjusted mean scores on the four factors of the TRI for each treatment group



	treatment value	treatment concerns	decision satisfaction	disease cure
medication	4.26 [a, b]	2.29 [a]	3.96 [a]	2.91 [a]
ptca	4.16 [b]	2.55 [a, b]	4.20 [a,b]	3.84 [b]
cabg	4.45 [a]	2.74 [b]	4.36 [b]	4.10 [b]