Illness perception in patients with coronary artery disease: A systematic review

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The aim of this study was to conduct a systematic review that investigates the differences in illness perception with age and gender in patients diagnosed with coronary artery disease. Previous studies show some discrepancies regarding the influence of age and gender on the specific dimensions of coronary artery disease patients’ illness perception. A systematic review using a narrative synthesis process included preliminary synthesis, exploration of relationships and assessment of the robustness of the synthesis and findings was conducted. Search terms were used to identify research studies published between 1996 and December 2014 across four key databases: CINAHL, Medline, PsycINFO and Web of Science. A total of 14 studies met the inclusion criteria of the review. The review found that men had a stronger perception that their own behaviour had caused their illness than women. In addition, older patients had lower perceptions of the consequences and chronicity of their illness. This analysis concludes that some dimensions of illness perception vary according to age and gender of patients with coronary artery disease. These differences should be taken into consideration, particularly when providing health education and cardiac rehabilitation.

Key words: age, coronary artery disease, gender, perception of illness, systematic review.
SUMMARY STATEMENTS
What is already known about this topic?
• Illness perception among patients with Coronary Artery Disease influences their coping responses, wellness and adherence to healthy lifestyles.
• Discrepancies are reported regarding the influence of age and gender on the specific dimension of CAD patients’ illness perception.

What this paper adds
• Younger patients with Coronary Artery Disease had greater perception of the consequences and chronicity of their disease compared to older patients.
• Male patients more often perceived their health-related behaviours as causes of their illness, while females were more likely to attribute psychological and non-behavioural reasons.

The implications of this paper
• The current review indicates that screening of illness perceptions amongst different ages and genders is worthwhile.
• Differences in illness perceptions based on age and gender should be taken into consideration when assessing and educating patients with Coronary Artery Disease.
• This review recommends further exploration of differences in illness perceptions for factors beyond demographic details.

INTRODUCTION
Coronary Artery Disease (CAD) is a leading cause of death among both men and women worldwide; about 7.3 million deaths were attributed to CAD in 2008. Specific risk factors increase the risk of build-up of plaque within the coronary arteries. These factors include modifiable risk factors such as smoking, hypertension and diabetes, while non-modifiable risk factors include gender, age and family history. CAD is an inclusive term that describes a variety of conditions caused by coronary atherosclerosis, such as stable or unstable angina, acute myocardial infarction (AMI), percutaneous coronary intervention (PCI) and coronary bypass graft surgery (CABG).

The term ‘illness perception’ refers to the organized beliefs patients construct about the characteristics of their illness. Leventhal et al. (1984) identified five core dimensions. These were: beliefs about commonly experienced illness symptoms (identity), perceived duration of the illness (timeline), causal factors (causal attributions), expected effects and outcome of the illness (consequences), and curability and controllability of illness (control/cure) which help individuals to make sense of their illness and provide a foundation for their coping responses. Later research by Leventhal et al. (1998) has highlighted the importance of patients’ understanding of the illness (illness coherence), and the emotional impact of the illness (emotional representation).

The illness perceptions of patients with CAD have been considered a predictor of their functional status, returning to work, depressive symptoms and attendance at cardiac rehabilitation clinics. Research indicates that patients’ perception of illness influences their coping responses, wellness and adherence to healthy lifestyles. Illness perception might also change over time. The development of the Illness Perception Questionnaire (IPQ) and the revised form of IPQ (IPQ-R) by Moss Morris et al. (2002) has provided a validated measurement tool. Some sources assert that CAD patients’ illness perception is influenced by socio-demographic factors such as age and gender. Negative perceptions and depression have been shown to be associated with old age and low socio-economic status after onset of CAD. Previous studies have shown differences in the perception of illness amongst CAD patients according to age.

However, some of these studies point to discrepancies regarding the influence of age and gender on the specific dimensions of patients’ illness perception. Further understanding of these differences will enable professionals to better understand any association between illness perception and these variables and facilitate more specific education and intervention for particular groups of CAD patients. To our knowledge, there is no previous systematic review that has investigated this relationship. The current study will address this gap in the literature and have the potential to inform clinical practice. The aim of this review is to investigate any differences in illness perception with age and gender amongst patients diagnosed with CAD.

The following review questions were identified:
1. Does illness perception differ with gender in people diagnosed with CAD?
2. Does illness perception vary with age in people diagnosed with CAD?

REVIEW METHODS
A narrative systematic review was conducted to investigate differences in illness perception according to age and gender amongst patients diagnosed with CAD.
Data sources
A systematic search was conducted across four databases: the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, PsycINFO and Web of Science. In addition, a manual search of references from selected articles was conducted to include additional relevant studies. The search was run from 1996 to December 2014 to reflect the period within which interest in the measurement of illness perception grew, in part stimulated by the development of the Illness Perception Questionnaire.16

Search strategy
The search strategy was developed with input from Information Scientists. Each electronic database was searched using the specific search terms applicable to each database, as shown in Table 1. The search terms selected were based on the previously stated key words of related systematic review studies.12,21 Inclusion and exclusion criteria were as follows:

1. Studies that included adult participants (18 years old and over), with the diagnosis of at least one of the following: AMI diagnosed with or without ST segment elevation, stable angina, unstable angina or treatment with any of the following: CABG, PCI and Primary PCI.
2. Studies that used a quantitative design and investigated the relationship or differences between one or more illness perception dimension(s) in patients of any age or gender.
3. Only peer-reviewed full texts, published in English language studies, were included.

Quality assessment
The quality assessment of the studies that were included was conducted using the modified version of Downs and Black’s checklist, which was originally developed to assess both randomized controlled trials (RCT) and non RCT to guide the judgment of the relevance and reliability of the studies.22 The modified quality checklist used in the current study enabled assessment of study relevance and reliability and excluded intervention-related items (see Supporting Information File 1).12 A possible quality score for each article ranged from 0 to 19, with 19 as the highest possible score. For the purpose of initial assessment of the quality of the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Search strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Search criteria</strong></td>
<td><strong>Medline</strong></td>
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<tr>
<td>Illness* OR health*</td>
<td>Illness* OR health* (AND)</td>
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<tr>
<td>(AND)</td>
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<tr>
<td>percep* OR cognit* OR attitud* (AND) ‘Adult’ (AND)</td>
<td>percep* OR cognit* OR attitud* OR cognit* (AND) ‘Adult’ (AND)</td>
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</table>
articles, two researchers independently conducted a quality assessment of each paper. Utilizing the Cohen’s Kappa test, inter-rater reliability was checked based on the two researchers’ input for each study.

Decisions about the quality of each study were based on both quality assessment scores and again checked and agreed by two independent investigators. When there was a discrepancy between any of the checklist items, both investigators reviewed the item and the particular article and came to a consensus decision. As it was expected that the majority of studies would be observational studies and would contain comprehensive data, all relevant studies were included in the current systematic review.

Data extraction and synthesis
A data extraction table was designed to collate information from each study. A narrative synthesis was chosen as researchers anticipated heterogeneity of the studies, such as participant characteristics, and study design.

The procedure of data synthesis conducted in this review included the following stages: preliminary synthesis of the studies (including tabulation and describing each study results; organizing studies based on population, and design; and translating data into main concepts across the studies), exploration of relationships and noting any homogeneity and heterogeneity of the data (including exploring relationships and differences between population characteristics and studies’ findings; exploring differences between different studies), and assessing the robustness of the synthesis (drawing conclusions based on the strength of evidence). Two researchers independently synthesized the findings. When there was no consistency in synthesized results, a discussion between investigators was conducted to reach consensus. Extracted information was tabulated for ease of data synthesis.

Search outcome
Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Guidelines including the PRISMA checklist and flowchart were used. As shown in Figure 1 (PRISMA flowchart), a total of 1332 articles were identified from four different database searches, and two articles were identified by a manual search of the reference sections of studies that were selected by electronic search. A total of 873 remained after duplications were removed and screened for eligibility, and following this 51 full text articles were assessed for eligibility. However, 37 articles did not meet inclusion criteria (i.e., did not investigate the differences based on age and/or gender, or used qualitative methods). Based on the inclusion and exclusion criteria, 14 studies were eligible for inclusion in this review.

Quality appraisal
The quality assessment revealed scores ranged from 12 to 19, with 19 as the highest possible score. However, these scores were considered mainly in synthesizing the results (i.e. when there were inconsistent results between articles under review results, the studies with higher quality scores were given higher weight in the synthesis than those with lower quality scores). The lowest item scores related to four criteria. Five studies did not discuss clearly the generalisability of study results. Five studies did not provide thorough explanations/reasons for attrition, and included participants that had dropped out. Three more studies did not report the actual probability values that had been calculated (i.e. they report the probability as <0.05 rather than a specific number of probability value). In addition, seven studies did not provide estimates of the random variability in the data for the main outcomes.

Cohen’s Kappa test was performed to determine the agreement between the two researchers’ judgment, demonstrating strong agreement ($k = 0.91, p < 0.001$).
RESULTS

Description of included studies
An overview of included studies is shown in Table 2. The mean age among participants from 12 studies was 57.66 years. However, the mean age was not reported by two studies (i.e., median age = 57 years for each). The percentage of males in the studies ranged from 50% to 87.1%, while female representation ranged 12.9% to 50%; overall, 69.96% of participants were male.

Of the 14 included studies seven examined differences in illness perception as a continuous variable, while four studies categorized age into those under 65, 65 years or older, and one study categorized participants as under or 60 years and older. Another study categorized participants as under or 57 years of age and older.

The studies in this review included different CAD populations but the majority of studies included MI (n = 12). In addition, two studies included Percutaneous Transluminal Coronary Angioplasty (PTCA) and CABG. Angina, PCI and CAD featured in one study for each of these categories. Ethnicity of participants was not reported in seven studies. The majority of the studies were conducted in European countries (n = 10). Studies used both longitudinal (n = 9) and cross-sectional methods (n = 5) and recruited both inpatient (n = 9) and outpatient participants (n = 10). The majority of studies analysed the results using regression (n = 4 linear regression, and n = 4 logistic regression). Six of the studies used t-independent tests and correlation tests.

The included studies utilized different measures to assess illness perception. The majority of studies used the Illness Perception Questionnaire-Revised (IPQ-R) (n = 6) and Illness Perception Questionnaire (n = 4). Two studies utilized the Sense of Coherence (SOC), and one used a brief Illness Perception Questionnaire (B-IPQ); another study used 13 questions and assessed the main possible contributory factors.

Illness perception, age and gender
One study measured illness perception as a whole construct using the B-IPQ. This study found female gender associated with significantly greater illness perception scores. However, there was no correlation based on participants’ age.

Attributions, age and gender
The attribution subscale was excluded in nine studies. Studies that examined attribution results indicated consistent findings in relation to gender differences; males demonstrated a stronger perception that health-related behaviour (lifestyle) caused their illness, while females reported greater psychological attribution and non-behavioural reasons as causes of their illness, such as stress and hereditary conditions.

In summary, males perceived higher behavioural causes of illness compared to females.

Of the five studies that examined variation in attribution based on age, four showed significant differences, but these also demonstrated inconsistent results: that younger participants more often related the causes of their illness to their relevant behaviours, to stress at baseline and follow-up time points, and also to life course factors compared to older groups. Two studies reported contradictory results relating to genetic factors as a cause of the illness; one found that perception of genetic inheritance as a cause of illness was higher among younger participants, and another found the perception of genetic influence was of greater concern among older participants. There were no differences between baseline and follow-up time points for both age and gender differences in relation to contributory factors. In conclusion, there were inconsistent findings in the attribution based on patients’ age, and further studies are needed to explore these relationships.

Illness identity, age and gender
Studies that examined differences in illness identity based on age showed consistent results; four studies found no significant differences in identity. Only one study found that younger participants had significantly higher illness identity awareness after one year of CAD hospitalization. As a conclusion, the current review found no relationship between illness identities based on patients’ age. However, research examining this relationship in the future might develop these findings.

In relation to illness identity and gender differences, three studies did not find significant differences. Only two studies showed significantly higher reporting of symptoms among female participants compared to males during CAD hospitalization, at one year after CAD hospitalization. Both studies had high quality scores. Therefore, we concluded that any relationship between identity and patients’ gender was unproven and needs further evidence.

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<table>
<thead>
<tr>
<th>Authors/country</th>
<th>Design</th>
<th>Response rate</th>
<th>Participants</th>
<th>CHD classification</th>
<th>Illness perception measures</th>
<th>Key findings</th>
<th>Quality rating*</th>
</tr>
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<tbody>
<tr>
<td>Dickens et al. (2008)</td>
<td>L: T1 during hospitalization, T2 at 6 months, T3 at 12 months</td>
<td>87.7%</td>
<td>N = 269. Age mean = 57.7 (SD = 11.2) years. Age categorized more than 57 (n = 135, 50.2%) and less than 57 (n = 134, 49.8%). Male 64%, female 36%</td>
<td>First MI</td>
<td>IPQ at T1; identity, timeline, consequences and cure/controlled. No attribution without justifications</td>
<td>Younger participants perceived higher consequences; P &lt; 0.005</td>
<td>13</td>
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<tr>
<td>Reges et al. (2011)</td>
<td>L: T1 during hospitalization, T2 2–2.5 years after discharge</td>
<td>64% at T1, and 96% at T2</td>
<td>N = 178. Age mean = 55.6 years (SD = 11); age classified into less than 65 (n = 147, 82.6%) and more than 65 (n = 28, 17.4%); Male 87%, female 23%. Hebrew speaking</td>
<td>AMI</td>
<td>Possible contributing factors questionnaire</td>
<td>At T1: older patients were less likely to make conventional attributions (such as smoking, overweight and hyperlipidemia; beta = 0.035, P &lt; 0.05. Younger age was found to be associated with attributing the illness to conventional risk factors; beta = 0.036, P &lt; 0.01. Males had lower psychological attribution; beta = 0.88, P &lt; 0.05. No changes between T1 and T2</td>
<td>16</td>
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<tr>
<td>Stafford et al. (2009)</td>
<td>L: T1 3 months, T2 9 months</td>
<td>47.9% of original sample participated. 74.28% retention at T2</td>
<td>N = 193. Age less than 65 years (n = 95, 49.2%), more than 65 years (n = 98, 50.8%).</td>
<td>PTCA, MI or CABG</td>
<td>IPQ-R No attribution and coherence without justification</td>
<td>At T1: younger participants had higher consequences; P = .003. Older participants had poorer personal control;</td>
<td>19</td>
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<tr>
<td>Study</td>
<td>Setting</td>
<td>Sample Size</td>
<td>Gender Distribution</td>
<td>Age Range</td>
<td>Health Condition</td>
<td>Measure</td>
<td>Findings</td>
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<td>Grace et al. (2005)</td>
<td>Canada</td>
<td>N = 661</td>
<td>Male: 80.8%, Female: 19.18%</td>
<td>Mean age = 64.14, SD = 10.37</td>
<td>CAD</td>
<td>IPQ except identity and emotional representation without justification</td>
<td>Males were significantly more likely to attribute causation to diet, overwork and alcohol; P &lt; 0.001, perceived greater personal control; P &lt; 0.001, and greater treatability; P &lt; 0.05 compared to females. Females had more cyclical episodes; P &lt; 0.05, more likely to blame heredity; P &lt; 0.001, and perceived a significantly more chronic course; P &lt; 0.001. Older participants were significantly more likely to endorse ageing as a causal factor than younger; P &lt; 0.001.</td>
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<tr>
<td>Aalto et al. (2005)</td>
<td>Netherlands</td>
<td>N = 3130 at baseline and N = 2745 at 1 year follow-up</td>
<td>Male: 50%, Female: 50%</td>
<td>Mean age = 64.4, SD = 7.0</td>
<td>Coronary heart disease</td>
<td>IPQ and attribution measured using: IPQ-R</td>
<td>At T1: females compared to men perceived lower symptoms; beta = 0.2, control; beta = 0.07, and higher perception of stress; beta = 0.01, and genes as causes; beta = 0.42, all at significant P &lt; 0.001. Males compared to...</td>
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<td>Finnish-speaking</td>
<td>(SD = 6.4).</td>
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<td>women perceived higher perception of causes as risk behaviours; beta = 0.56, internal causes; beta = 0.15, and epidemiological factors; beta = 0.08, $P &lt; 0.001$, and higher consequences; beta = 0.53, $P &lt; 0.01$. Older perceived shorter duration; beta = 0.06, lower stress; beta = 0.12, risk behaviours as causes of illness; beta = 0.12, $P &lt; 0.01$, higher perception of life course; beta = 0.08, and gen as causes; beta = 0.07, $P &lt; 0.01$. Younger perceived higher consequences; beta = 0.02, $P &lt; 0.001$. Changes at T2: females had more symptoms; beta = 0.09, $P &lt; 0.001$, younger perceived higher control over their illness; beta = 0.07, more symptoms; beta = 0.09, and longer duration of illness; beta = 0.07, $P &lt; 0.001$</td>
<td>(1/19)</td>
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<tr>
<td>Study</td>
<td>Location</td>
<td>Timepoints</td>
<td>Sample Size</td>
<td>Retention Rate</td>
<td>Age Information</td>
<td>Gender Distribution</td>
<td>Ethnicity</td>
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<td>Bergman et al.</td>
<td>Sweden</td>
<td>T1 6 months, T2 1 year and T3 2 years after hospitalization</td>
<td>N = 84, Aged 36–70 years, median age of 57 years. Male = 78.5%, female 21.5%. Ethnicity not reported</td>
<td>First time MI</td>
<td>N = 84. Aged 36–70 years, median age of 57 years. Male = 78.5%, female 21.5%. Ethnicity not reported</td>
<td>First time MI</td>
<td>SOC scale</td>
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<tr>
<td>Bergman et al.</td>
<td>Sweden</td>
<td>T1 At the hospital T2 2 weeks T3 4 weeks later</td>
<td>N = 100 patients Ages range 36–70 years, median 57 years. Male 79%, female 21%. Swedish speaking</td>
<td>First time MI; PCI = 69, CABG 14, Fibrotic = 4, Medications = 13</td>
<td>N = 100 patients Ages range 36–70 years, median 57 years. Male 79%, female 21%. Swedish speaking</td>
<td>First time MI; PCI = 69, CABG 14, Fibrotic = 4, Medications = 13</td>
<td>SOC scale</td>
</tr>
<tr>
<td>Dunkel et al.</td>
<td>Germany</td>
<td>T1 before surgery, T2 one year after CABG</td>
<td>N = 979, age mean = 66.8 (SD = 9.03). Male; 80.1% (Mean age = 65.85, SD = 8.01), female; 19.9% (Mean age = 70.02, SD = 9.38). Ethnicity not reported</td>
<td>CABG</td>
<td>CABG</td>
<td>CABG</td>
<td>IPQ-R (i.e. only attribution)</td>
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<tr>
<td>French et al.</td>
<td>United Kingdom</td>
<td>T1 during hospitalization, T2 6 months later</td>
<td>N = 194. Mean age = 63.3 years (S.D. = 10.6). Male 73.2%, female 26.8%. Ethnicity not reported</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>IPQ (i.e. no attribution and identity authors justify this to decrease burden on the respondents)</td>
</tr>
<tr>
<td>Alse´ n et al.</td>
<td>Sweden</td>
<td>T1 First week of hospitalization</td>
<td>N = 204. Male; age mean = 64 years (SD = 10), female; Mean age = 65</td>
<td>MI</td>
<td>MI</td>
<td>MI</td>
<td>IPQ-R (i.e. except identity and attribution without giving a justification)</td>
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<table>
<thead>
<tr>
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<th>Design</th>
<th>Response rate</th>
<th>Participants</th>
<th>CHD classification</th>
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<th>Key findings</th>
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<tbody>
<tr>
<td>Brink E et al. (2011)</td>
<td>C-S: 4 months post MI</td>
<td>86%</td>
<td>N = 202. Age mean = 64 years (SD = 10). Male 71.28%, female 28.72%. Speak Swedish</td>
<td>MI; PCI 71.28%, CABG 7.4%, medical treatment 21.32%</td>
<td>IPQ-R (i.e. except attribution; they justified that attribution items not related to CHD/ and identity not valid among Sweden)</td>
<td>Females reporting higher scores of cyclical than males; p &lt; 0.001</td>
<td>16</td>
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<tr>
<td>Lau-Walker (2004)</td>
<td>C-S</td>
<td>84%</td>
<td>N = 253. Age mean = 65.3 years (SD = 10.8). Age categorized less than 65 (n = 109, 43.1%), and more than 65 (n = 144, 56.9%). Male 78.6%, female 21.4%. English speaking</td>
<td>CAD; MI 49.8%, angina 50.2%</td>
<td>IPQ (i.e. except attribution without justification)</td>
<td>Females’ patients identified more symptoms than males; p &lt; 0.05.</td>
<td>17</td>
</tr>
<tr>
<td>Steca et al. (2012)</td>
<td>C-S</td>
<td>Response rate not reported</td>
<td>N = 116. Age mean = 65.56 years (SD = 9.99; range 38–85 years. Age categorized less than 65 (n = 54, 46.6%), and more than 65 (n = 62, 53.4%). Male; 79.3%,</td>
<td>AMI, PCI, CABG.</td>
<td>Brief-IPQ</td>
<td>Total illness perception scores positively correlated to female gender; r = 0.28, P &lt; 0.01</td>
<td>16</td>
</tr>
<tr>
<td>Yan et al. (2011)</td>
<td>C-S</td>
<td>93.7%</td>
<td>MI</td>
<td>Female; 20.7%. Italian language speaking N = 193. Age mean = 64.2 years (SD = 12.2). Age ranged 32–85 years, less than 60 years = 71 (36.8%), more than years 60 = 122 (63.2%). Female 24.9%, male; 75.1%. Ethnicty not reported</td>
<td>IPQ-R</td>
<td>Males attributed more to behavioural causes; beta = 0.17, P &lt; 0.01. Females attributed more to stress as a cause; beta = 0.34, P &lt; 0.01, and had higher emotional representation; beta = 0.34, P &lt; 0.01, compared to males. Older had lower consequences; beta = 0.43, emotional representation; beta = 0.43, (P &lt; 0.01), and cyclical; beta = 0.18, P &lt; 0.05, compared to younger</td>
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**Abbreviations:**
Study design: C-S, cross-sectional; L, longitudinal; T1, time point 1; T2, time point 2; T3, time point 3.
Classification: CABG, Coronary Artery Bypass Graft; CHD, Coronary Heart Disease; MI, Myocardial Infarction; AMI, Acute Myocardial Infarction; PTCA, Percutaneous Transluminal Coronary Angioplasty Measures, IPQ-R; Illness Perception Questionnaire—Revised; IPQ, Illness Perception Questionnaire; SOC, Sense of coherence scale; *; Quality checklist (see Supporting Information file 1).
Illness control, age and gender

Among the five studies that examined patients' perception of control based on age,\textsuperscript{18–20,29,32} only two studies revealed significant differences.\textsuperscript{18,20} Both studies found that older participants perceived significantly lower illness control during hospitalization for CAD\textsuperscript{18} and three months afterwards. One study found that older age was associated with a significantly lower perception of control one year after the diagnosis of CAD.\textsuperscript{20} Both studies had high quality review scores. Thus, the current review concluded that perception of control was not conclusively demonstrated to differ with age, but further research is warranted.

In relation to perception of control and gender, eight studies examined this, six of which found no significant differences.\textsuperscript{9,27,29,12,31,35} Two studies found that males perceived significantly higher control over the CAD compared to females.\textsuperscript{19,20} Both studies had high quality review scores, but we concluded that differences in patients’ perception of control were not demonstrated to differ by gender.

Consequences, age and gender

Among the nine studies evaluating illness consequences in relation to gender differences,\textsuperscript{9,18–20,26,27,29,32,33} only one study found significant differences\textsuperscript{20}; with males reporting significantly higher perceived consequences compared to females during CAD hospitalization. Overall, this did not indicate differences in patients’ perception of illness consequences based on gender.

Significant differences in illness consequences based on participants’ age were found in five studies,\textsuperscript{9,20,27,29,35} with a consistent finding that younger participants perceived significantly higher consequences compared to older groups. Therefore we concluded that differences were demonstrated in patients’ perception of illness consequences according to age.

Illness coherence, age and gender

Among the six studies that examined the relationship between illness coherence and gender,\textsuperscript{19,23,24,27,12,33} only two studies found a significant correlation,\textsuperscript{24,25} revealing males with significantly higher illness coherence than females. Only one study examined the relationship between illness coherence and age and found a non-significant relationship.\textsuperscript{27} Despite this study having a high quality rating (19/19), we concluded that there was no difference demonstrated in patients’ illness coherence based on either their gender or age.

Timeline, age and gender

Of the 14 included studies, eight examined differences across the timeline based on participants’ gender. Four studies found that timeline perception (i.e. CAD chronicity and cyclicity) was significantly associated with female gender.\textsuperscript{18,19,24,32} Four studies found this relationship to be non-significant.\textsuperscript{9,20,27,29} As a result of inconsistency in results, we concluded that perception of disease timeline was not demonstrated to differ based on patients’ gender. However, further research is recommended to investigate this relationship.

In addition, five studies examined the predictors of age,\textsuperscript{9,20,27,29,35} and three studies found cyclicity to be a significant predictor of age\textsuperscript{20,27,39} and reported increased chronicity significantly correlated with younger age. These studies had an excellent quality rating (19/19), and we therefore concluded that patients’ perception of chronicity was demonstrated to differ based on their age.

Emotional representation of illness, age and gender

Only three studies measured emotional representation of illness\textsuperscript{27,32,33} in relation to gender and age differences and two studies found no significant differences.\textsuperscript{26,31} One study found that females and younger AMI hospitalized patients had a significantly higher emotional representation of illness compared to male and younger participants.\textsuperscript{27} While this study had a high quality review score, we concluded that differences were not demonstrated in emotional representation of illness based on age or gender. However, further research is recommended.

DISCUSSION

This systematic review revealed consistent findings that younger CAD participants had significantly higher perception of consequences and chronicity compared to older participants. In addition, female participants reported significantly greater attribution to psychological factors and lesser to health-related behaviours, compared to male participants. The important new contribution of this study is that gender and age can be important factors in determining perceptions of attribution, consequences and timeline among CAD patients.

Non-significant differences were consistently found in relation to associations between participants’ gender and identity, control, consequences, coherence and emotional dimensions, as well as consistent patterns of non-significant differences in identity, control and emotional dimensions based on participants’ age. Thus, we concluded that no
Evidence has suggested that perceptions of the CAD timeline are an important determinant driving desirable behavioural changes. The perception that CAD is a chronic illness of longer duration was associated with higher motivation and confidence in changing behaviour compared with CAD patients who perceived their illness as acute and of a shorter duration. The current review found that older CAD patients perceived their illness as acute rather than chronic, compared to younger patients, and this might affect their eventual behavioural change. However, many other findings were inconsistent, such as differences in timeline based on participants’ gender, and differences in attribution based on participants’ age.

Previous studies have shown greater perception of illness consequences among CAD patients associated with improved attendance at cardiac rehabilitation programs, and that patients with lower perception of control over their illness might demonstrate less desirable behavioural changes. The current review revealed older CAD patients perceived lower consequences of their illness, which could limit their behavioural changes after being diagnosed with CAD.

Previous studies have shown that appropriate illness perception and awareness of the CAD causes, such as illness-related behaviours, have motivated patients to change modifiable risk factors and increased their possibility of attending cardiac rehabilitation programs, as well as focusing on a healthy lifestyle after their illness. The current review found that female patients had a lower perception of illness-related behaviours and rated psychological-related factors higher as causes of their illness. Such perceptions of the causes of their CAD might inhibit their ability to change behaviours and more research on the impact of gender differences on illness perception is warranted.

The current study revealed inconsistent differences in attribution and timeline dimensions. In addition, other dimensions in relation to gender and age differences were examined less often in these reviewed studies. However, other studies have indicated the importance of these factors among patients diagnosed with CAD. Perceptions of symptoms (i.e., identity) are considered an important factor affecting health-related behaviours such as help-seeking behaviours, adherence to treatment regimens and patients’ self-diagnosis. Improving patients’ understanding of their illness (illness coherence) with established CAD could encourage them to change their behaviours. Often, there is a mismatch between what a patient believes is the risk of developing a further heart attack and the actual risk.

The emotional representation of the illness is another component of illness representation that might contribute to behavioural changes. For example, negative perceptions about heart disease in the days following admission to hospital with a first MI are associated with the development of depression, which might affect patients’ coping behaviours. Moreover, higher emotional representation among established CHD has been found to be associated with lower engagement in exercise after the illness. These findings indicate the need for further research to examine the differences based on age and gender.

**Study implications**

This review highlights the importance of CAD patients’ age and gender as factors associated with some important illness perception dimensions and suggests screening illness perception among different age groups and both genders would be worthwhile. In addition, the study recommends using questionnaires that have different components of illness perception, with some factors shown to be more important when differentiating illness perceptions based on patient demographics. Moreover, the study highlights that specific illness perception dimensions such as perceptions of consequences, causal attributions, and timeline differences can be linked to CAD patients’ age and gender, which should be taken into consideration when assessing CAD patients’ illness perception and when they provide training to CAD patients.

It was not one of the objectives of this review to investigate the differences in illness perception among CAD patients based on other demographical characteristics such as patients’ level of education and marital status. Investigation of such factors might add to our knowledge that might help in understanding better the factors affecting illness perception. This review recommends further exploration of these factors among CAD patients.

**Limitations**

The results of this review should be treated cautiously as there are several limitations. It was noted that the majority of the studies reviewed did not report random variability in the data for the main outcomes and this could limit the generalisability of the findings. In addition, the current review included only peer-reviewed studies utilizing quantitative methods, and restriction to English language.
studies might lead to publication bias. Some scales did not include important illness perception factors such as identity, illness coherence and emotional representation. Although the majority of the results utilized the IPQ and IPQ-R to assess illness perception, some studies used different types of questionnaire; the use of different scales might reveal different results.

The current review includes samples of patients with different variants of CAD. The majority of studies recruited MI patients, while other types such as angina, post CABG and PCI, were less represented, which might limit the generalisability of findings. However, the majority of included studies had high quality rating scores with adequate descriptions of study aims, methods, results, discussion and limitations. In addition, the majority of the studies reviewed recruited large sample sizes, which provided a sample sufficient to detect differences based on age and gender.

CONCLUSION
The study revealed some differences in illness perception by age and gender. Both illness consequences and timeline differed based on CAD patients’ age, and causal attribution differed based on CAD patients’ gender. Women and older patients demonstrated concerning illness perceptions that might have clinical significance. Recommendations of the current study are that nurses assess the illness perceptions of patients diagnosed with CAD using a validated illness perception questionnaire that can be used to assess different dimensions of illness perception. In addition, nurses should take into consideration differences in illness perceptions based on age and gender, as demonstrated in this study, when provide training and education for patients diagnosed with CAD, as these differences might impact on later behavioural changes. Further recommendations of this study are for further research investigating illness perceptions among patients diagnosed with CAD. For example, some illness perception dimensions were not well studied in relation to gender or age; of the 14 studies in this review, only five examined differences in identity, six targeted coherence and three studied differences related to emotional dimensions. Further research with larger samples including all illness perception dimensions is warranted. In addition, different perceptions of the cause of CAD might influence patients’ ability to change their behaviour and more research on these complex inter-relationships is required. Other demographic characteristics were not investigated in the current systematic review. Investigation of the full range of individual characteristics will help further understanding of the factors affecting illness perception and hence behaviour change in patients diagnosed with CAD.

AUTHORSHIP STATEMENT
Corresponding author confirming that all listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.

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**SUPPORTING INFORMATION**

Additional supporting information may be found in the online version of this article at the publisher’s web site:

**Supplementary File 1:** Quality Checklist.