Results

Descriptives

In my draft

Optimism and Incident Cardiovascular Events

The 10studies reporting on cardiovascular events included 209 436 participants.Onpooled analysis,

optimismwas significantly associated with reduced risk of cardiovascular events (RR,0.65; 95%CI,0.51-

0.78; *P* < .001) (Figure 2).Ahigh heterogeneitywas observed in the analysis (*I*2 = 87.4%). Exclusion of

the study by Tindle et al,19 the largest study, did not result in any change in the pooled result (RR,0.63;

95%CI,0.48-0.78; *P* = .001). Visual inspection of the funnel plot showed evidence of publication bias

(smaller studies showing no beneficial effectswere missing). According to the trim-and-fillmethod, the

association between optimism and cardiovascular events remained significant after imputing 4 possible

missing studies (adjusted RR,0.77; 95%CI,0.61-0.92; *P* < .001) (eFigure in the Supplement).

Optimism and All-Cause Mortality

The 9 studies (10 comparisons) reporting on all-cause mortality included 188 599 participants. On

pooled analysis, optimism was significantly associated with reduced risk of all-cause mortality (RR,

0.86; 95%CI, 0.80-0.92; *P* < .001) (Figure 3). Moderate heterogeneity was observed in the analysis

(*I*2 = 73.2%). Exclusion of the study by Tindle et al19 did not result in any change in the pooled result

(RR, 0.86; 95%CI, 0.79-0.93; *P* < .001). Visual inspection of a funnel plot showed evidence of

Figure 2. Association Between Optimism and Cardiovascular (CV) Events

0 1.0 1.5

Effect Size (95% CI)

0.5

Source Weight, %

Effect Size

(95% CI)

Anthony et al,11 2016 0.94 (0.86-1.02) 12.37

Boehm et al,10 2011 0.69 (0.47-0.91) 9.75

Giltay et al,13 2006 0.57 (0.31-0.83) 8.64

Giltay et al,14 2004 0.23 (0-0.46) 9.53

Hansen et al,15 2010 0.58 (0.25-0.90) 7.40

Kim et al,16 2011 0.89 (0.82-0.96) 12.50

Kim et al,17 2016 0.62 (0.49-0.75) 11.55

Kubzansky et al,6 2001 0.44 (0.20-0.68) 9.19

Nabi et al,18 2010 0.52 (0.20-0.84) 7.50

Tindle et al,19 2009 0.76 (0.63-0.89) 11.55

Overall 0.65 (0.51-0.78)

Reduced Risk

of CV Events

Increased Risk

of CV Events

Heterogeneity: τ2 = .04, *I*2 = 87.4%

Random-effects Hartung-Knapp-Sidik-Jonkman Model

Boxes indicate mean values, with larger boxes

indicating greater weight; whiskers represent 95%CIs;

and the diamond indicates the pooled mean value with

the tips of the diamond representing the 95%CI of

the pooled mean.

Figure 3. Association Between Optimism and All-Cause Mortality

0.4 1.0 1.2

Effect Size (95% CI)

0.6 0.8

Source Weight, %

Effect Size

(95% CI)

Anthony et al,11 2016 0.99 (0.95-1.03) 15.37

Brummett et al,7 2006 0.86 (0.79-0.94) 13.35

Engberg et al,12 2013 (men) 0.91 (0.71-1.11) 5.92

Engberg et al,12 2013 (women) 0.85 (0.74-0.97) 10.45

Giltay et al,14 2004 0.71 (0.48-0.94) 5.05

Grossardt et al,8 2009 0.85 (0.76-0.95) 11.88

Mosing et al,9 2012 0.72 (0.50-0.94) 5.21

Tindle et al,19 2009 0.86 (0.79-0.93) 13.72

Kim et al,17 2016 0.91 (0.85-0.97) 14.42

Weiss-Faratci et al,20 2017 0.67 (0.43-0.91) 4.61

Overall 0.86 (0.80-0.92)

Reduced Risk of

All-Cause Mortality

Increased Risk of

All-Cause Mortality

Heterogeneity: τ2 = .01, *I*2 = 73.2%

Random-effects Hartung-Knapp-Sidik-Jonkman Model

Boxes indicate mean values, with larger boxes

indicating greater weight; whiskers represent 95%CIs;

and the diamond indicates the pooled mean value with

the tips of the diamond representing the 95%CI of

the pooled mean.

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publication bias. According to the trim-and-fill method, the association between optimism and

all-cause mortality remained significant after imputing 4 possible missing studies (adjusted RR, 0.90;

95%CI, 0.83-0.97; *P* < .001) (eFigure in the Supplement).

Subgroup Analysis

Subgroup analysis by method of assessment for optimism, follow-up duration, sex, study location,

depression, educational level, socioeconomic status, and exercise or physical activity yielded largely

similar results for the associations between optimism and pessimism and the risk for either

cardiovascular events or all-cause mortality (Table 2).

Assessment of Linear Trend

Among the 15 studies, optimism and pessimism were assessed solely as a continuous variable in 2

studies.7,9,11 In the other 13 studies, participants were divided into either tertiles or quartiles and a

statistical assessment was performed regarding the presence or absence of a significant linear trend

between levels of optimism and reduced risk for cardiac events and/or all-cause mortality (eTable 1

in the Supplement). In 12 of 15 studies, a significant linear trend was observed.

Discussion

A review of the literature has noted associations between a number of psychosocial risk factors,

including negative emotions such as depression and anxiety, social factors (eg, loneliness), and

certain chronic stress conditions, with cardiovascular disease. Specific mindsets, habitual patterns of

thinking which influence individuals’ views and interactions, have also been associated with

cardiovascular disease risk. Using the strongest epidemiologic methods available, a growing body of

Table 2. Relative Risk of Adverse Events Associated With Optimism Within Subgroups

Measures

Pooled Relative Risk (95% CI)

Cardiovascular Events All-Cause Mortality

Measurement scale

Life Orientation Test–Revised 0.71 (0.57-0.86) 0.87 (0.78-0.96)

Other 0.50 (0.23-0.77) 0.84 (0.76-0.93)

Predominant sex cohorta

Male 0.57 (0.41-0.74) 0.81 (0.70-0.93)

Female 0.67 (0.49-0.85) 0.89 (0.82-0.95)

Country

United States 0.73 (0.60-0.86) 0.90 (0.85-0.96)

Other 0.42 (0.20-0.65) 0.79 (0.69-0.90)

Depression

Adjusted 0.66 (0.54-0.77) 0.85 (0.73-0.97)

Not adjusted 0.64 (0.43-0.86) 0.87 (0.80-0.94)

Follow-up, y

<10 0.68 (0.51-0.86) 0.90 (0.79-1.00)

≥10 0.52 (0.36-0.68) 0.83 (0.76-0.91)

Educational level

Adjusted 0.60 (0.43-0.76) 0.84 (0.76-0.93)

Not adjusted 0.78 (0.57-0.99) 0.89 (0.80-0.97)

Employment grade or socioeconomic status

Adjusted 0.69 (0.48-0.91) 0.81 (0.69-0.92)

Not adjusted 0.64 (0.49-0.79) 0.89 (0.82-0.95)

Exercise or physical activity

Adjusted 0.73 (0.62-0.85) 0.90 (0.80-0.96)

Not adjusted 0.56 (0.32-0.80) 0.83 (0.76-0.91)

a Considered to be predominant if the sex represented

more than 50% of the study population.

research has investigated whether the mindset of optimism vs pessimism might be associated with

cardiovascular disease and has also explored potential mechanisms underlying these associations.

Herein, we report the results of a comprehensive systematic review and meta-analysis to assess the

association between optimism and pessimism and adverse cardiovascular outcomes.

This meta-analysis consisted of 15 studies6-20 involving 229 391 participants. Ten of the studies

assessed the association between optimism and pessimism and adverse cardiovascular outcomes.

In 9 of 10 studies,6,10,11,13-19 there was a significantly lower risk of cardiovascular events among

individuals with high optimism scores after adjustment for a variety of clinical measures in each

study. The overall pooled risk ratio for cardiovascular events among individuals with high optimism

levels was 0.65. Among 9 studies,7-9,11-13,17,19,20 optimism was also associated with a reduction in

all-cause mortality, but the decrease in risk was more modest, with an overall pooled risk ratio of

0.86. As with cardiovascular events, the results among studies were consistent, with 8 of 9 studies

showing lower risk of all-cause mortality among the most optimistic individuals.