

The Influence of Worrying on the Association between Negative Life-Events
and the Chronicity of Late-Life Depression.

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Masterthese Klinische Psychologie

Augustus 2015, Vrije Universiteit Amsterdam

Abstract

Background. Previous studies have shown that negative life-events are associated with both episodic and chronic late-life depression, while worrying seems to associate with a more chronic course of depression. This study aims to examine whether worrying explains the association between negative life-events and the chronicity of late-life depression.

Methods. Data were used from the Netherlands Study of Depression in Older Persons (NESDO), in which negative life-events and worrying were measured in chronic ($N=93$), episodic ($N=255$), and non-depressed ($N=127$) older adults (between 60-93 years old). Logistic regression analyses were performed.

Results. The findings demonstrated that worrying did influence the association between negative life-events and chronic late-life depression in males and not in females. Secondly, no association between negative life-events and episodic late-life depression was found in males. Lastly, the strength of the association between negative life-events and episodic late-life depression increased when aging.

Conclusions. The findings suggested that for males, worrying did influence the course of chronic late-life depression when exposed to a negative life-event. This outcome as well as other findings of the present study could be useful for the development of a broader framework regarding the interaction between negative life-events, worrying and depression in older adults.

Keywords: psychological stress, worrying, negative life-events, late-life depression, chronic late-life depression, episodic late-life depression, older adults, clinical population.

1. Introduction

Psychological stress is a common phenomenon in Western society and is experienced at every age (Cohen, Janicki-Deverts & Miller, 2007; Folkman, 2010). Psychological stress is caused by the exposure to stressors, such as negative life-events (Korten, 2014). Most older adults are exposed to negative life events, which are often related to loss, for instance loss of a spouse or loss of a child (Cahoon, 2012; Fiske, Wetherell & Gatz, 2009). The degree to which one experiences psychological stress after exposure to a stressor depends on how one perceives, appraises and copes with the relevant stressors (Folkman, 2010; Korten, 2014; Seaward, 2015). Worrying is known to enlarge the amount of perceived psychological stress after exposure to a stressor (Seaward, 2015). Worrying is described as a negative coping style, with an intrusive cognitive process concerning the future, focusing mostly on the presumed negative outcome (Dimaggio, Montano, Popolo & Salvatore, 2015; Szabó, 2011). Worrying is often experienced by older adults; in a study on worrying in community dwelling older adults, 79% of the participants reported worrying (Golden *et al.*, 2011).

Psychological stress significantly affects the daily functioning and (mental) well-being of older adults and can contribute to the occurrence of late-life depression (Fiske *et al.*, 2009; Golden *et al.*, 2011; Gotlib & Hammen, 2009; Pachana & Laidlaw, 2014; Vink, Aartsen & Schoevers, 2008). According to the Stress-Vulnerability Model (Zubin & Spring, 1977), the interaction between stress, vulnerability and protective factors lead both to the onset and the maintenance of late-life depression (Comijs *et al.*, 2011; Goh & Agius, 2010; Golden *et al.*, 2011; Mandelli *et al.*, 2015).

A distinction between types of late-life depression can be made with respect to the chronicity of late-life depression, i.e., between chronic and episodic depression (Koorevaar *et al.*, submitted). An older individual is classified as ‘chronic depressed’ when suffering from dysthymia or when suffering from chronic major depressive disorder (MDD), and is classified

as ‘episodic depressed’ when suffering from a first episode or recurrent depression (Koorevaar *et al.*, submitted).

It is suggested that both chronic and episodic late-life depression have many predictors in common, but the actual influence of these predictors is not always equal (Pachana & Laidlaw, 2014). Previous studies have shown that both chronic and episodic late-life depression are associated with negative life-events (Fiske *et al.*, 2009), whereas worrying seems more closely related to chronic late-life depression than it is to episodic late-life depression. Although, little is known about the actual influence of worrying on the chronicity of late-life depression, several studies examined related concepts, such as daily hassles and rumination, which are strongly associated with worrying (Cardwell & Flanagan, 2005; Rathus, 2013; Watkins, Moulds & Mackintosh, 2005). Daily hassles are found to be strongly associated with dysthymia, and rumination is more strongly associated with chronic MDD than with episodic MDD (Nolen-Hoeksema, 2000; Ravindran *et al.*, 1995). This indicates that worrying is more strongly associated with chronic late-life depression than with episodic late-life depression.

It is also suggested that there is a link between age as well as sex and negative life-events, worrying and late-life depression. With respect to sex, it is observed that males experience less negative life-events, tend to cope more effectively with stressors, worry less and are less often depressed than females (Brock *et al.*, 2011; McGee, 2012; Moore *et al.*, 2015; Smith & Alloy, 2008). Regarding age, some studies found that individuals report less negative life-events when aging; other studies, however, did not find a decrease in reported negative life-events when aging (Cahoon, 2012; Contrada & Baum, 2010). Previous studies have anyhow shown that aging people are less often depressed than younger individuals and become less emotionally responsive to stressors: the influence of negative life-events on the

onset and maintenance of late-life depression and the amount of worrying decreases with age (Blazer & Hybels, 2005; Brock *et al.*, 2011; Neupert, Almeida & Charles, 2007).

Still little is known about the actual influence of worrying on the association between negative life-events and the chronicity of late-life depression. Based on previous research it seems reasonable to assume that worrying plays a role in the association between negative life-events and the chronicity of late-life depression. The present study is needed in order to expand the knowledge about the factors associated with the chronicity of late-life depression. This is considered to be critical for the improvement of the prevention and intervention for late-life depression (Fiske *et al.*, 2009; Gotlib & Hammen, 2009; Pachana & Laidlaw, 2014; Unützer *et al.*, 2008). Especially worrying is of interest because it is considered to be a treatable factor, for example with cognitive behavioral therapy (Richardson & Barusch, 2013).

The aim of the present study is to examine the influence of worrying in older adults on the association between negative life-events and the chronicity of late-life depression. Giving the prevailing theories it hypothesized in this study that negative life-events are associated with (both episodic and chronic) late-life depression. Secondly, it is hypothesized that worrying explains the association between negative life-events and chronic late-life depression, and does not explain the association between negative life-events and episodic late-life depression. Thirdly, it is hypothesized that the influence of worrying on the association between negative life-events and the chronicity of late-life depression is stronger for females than it is for males, and, in addition, that the influence of worrying on the association between negative life-events and the chronicity of late-life depression declines when aging.

2. Methods

2.1. Study sample

Data were obtained from the Netherlands Study of Depression in Older Persons (NESDO; www.nesdo.amstad.nl). NESDO is a longitudinal study to depressive and anxiety disorders in older persons (60 years and older). The recruitment for NESDO took place in mental health care institutions and general practices in five regions in the Netherlands, between 2007 and 2010 (Comijs *et al.*, 2011). The control group of non-depressed older adults was recruited from general practitioners (Comijs *et al.*, 2011). Exclusion criteria for all participants of NESDO were a clinical diagnosis of dementia or other serious psychiatric disorders, a Mini Mental State Examination score (MMSE) under 18 (out of 30 points) and insufficient command of the Dutch language. Besides these criteria, an exclusion criterion for the control group was a (lifetime) history diagnosis of depression. This resulted in a cohort including 378 depressed and 132 non-depressed older adults, between 60 and 93 years old ($M=70.1$ years old). For the present study data from the baseline measurement of NESDO were used in a cross-sectional design. In NESDO, the measurement took place in the morning and lasted about three to four hours. It included, amongst other things, interviews, which were audio taped and conducted by selected research assistants. The measurement took mainly place in a professional setting, but some of the respondents for whom coming to the study site was to great a burden got interviewed at home (Comijs *et al.*, 2011). A detailed description of the study can be found in the paper of Comijs *et al.* (2011)

3. Measurements

3.1. Chronic and episodic late-life depression

The Composite International Diagnostic Interview (CIDI; WHO version 2.1; lifetime version) was used to measure late-life depression (World Health Organization, 1997). The

CIDI is a structured clinical interview and is used in research settings (Wittchen *et al.*, 1991; Comijs *et al.*, 2011). The CIDI has a high validity for depressive and anxiety disorders (Wittchen *et al.*, 1991), and is used for the assessment of mental disorders according to the diagnostic criteria of DSM-IV-R (American Psychiatric Disorder, 2000) and the ICD-10 (World Health Organization, 1992). For the present study the results of the CIDI were used to make a distinction between chronic and episodic depression in older adults. Based on a previous study of Koorevaar *et al.* (submitted), older individuals have been classified as ‘chronic depressed’ when suffering from dysthymia, or when suffering from chronic major depressive disorder. Older individuals suffering from a first episode or recurrent depression and with no current diagnosis of dysthymia, have been classified as ‘episodic depressed’.

3.2. Psychological stress

3.2.1. Negative Life-events

The Brugha questionnaire was used to obtain information about negative life-events in the past five years (Brugha, Bebbington, Tennant & Hurry, 1985). The Brugha questionnaire has a high validity and high test-retest reliability (Brugha & Cragg, 1990). This questionnaire contains twelve items, representing twelve negative life-events, amongst them: ‘Death of first-degree relative including child or spouse’, ‘separation due to marital difficulties’, and ‘something valuable lost or stolen’ (Brugha *et al.*, 1985).

3.2.2. Worrying

The Worry Scale-R was used to measure worrying (Wisocki, Handen & Morse, 1986). The Worry Scale-R has a high test-retest reliability and the questions have a high internal consistency (Raabe, Weijers & Emmelkamp). The Worry Scale-R is a questionnaire containing 15 items, representing different topics, such as ‘I am worried that I will lose my

independence', 'I am worried that nobody will love me anymore', and 'I am worried that I will not be able to pay my health insurance'. The items are responded to on a 5-point Likert-scale. Possible answers are (1) not worried at all, (2) a bit worried, (3) somewhat worried, (4) rather worried, (5) very worried.

3.2.3 Confounders

The variables age, sex, years of education, smoking, alcohol consumption and average hours of sleep during the past four weeks were included to control for possible confounding. Age, sex, years of education were obtained by standard socio-demographic questions (Comijs *et al.*, 2011). Information about the current smoking status of the respondents (smoker and non-smoker) was obtained by standard questions as well (Comijs *et al.*, 2011). Alcohol consumption was measured by the Alcohol Use Disorder Identification Test (AUDIT; Babor, Kranzler & Lauerman, 1989), measuring the mean number of alcoholic drinks consumed a day. The average hours of sleep per night during the past four weeks of the older adults was obtained by the Insomnia Rating Scale (Levine, 2003).

3.4. Statistical analyses

To analyze differences in baseline characteristics of the chronic, episodic and non-depressed older adults, two types of tests were conducted. All continuous variables were non-normally distributed, so Kruskal-Wallis tests were used to compare the continuous variables, while Pearson's Chi-Square tests were used to compare categorical variables. In case differences in baseline characteristics were found, the variables indicated above were taken into consideration for possible confounding in further analyses. Differences between chronic and episodic depressed older adults on reported negative life-events and worrying were examined by Mann-Whitney tests.

A multinomial logistic regression analysis, adjusted for possible confounding, was performed to examine the associations between negative life-events and both chronic and episodic late-life depression. The non-depressed older individuals were used as reference group in this analysis. To examine whether worrying explained the association between negative life-events and chronic and/or episodic late-life depression, worrying was added to the fully adjusted multinomial logistic regression analysis. In case the strength of the association (B) between negative life-events and chronic and/or episodic late-life depression decreased with 10% or more, worrying was considered an explanatory factor. Lastly, the interaction terms worrying*sex and worrying*age were subsequently added to the fully adjusted multinomial logistic regression to check for possible sex and age differences. When these interactions were significant ($p < 0.05$), the (multinomial) logistic regression analyses were repeated in stratified samples based on sex and age. For the analysis in stratified sample according to age, two groups were made, based on the median age of the participants.

Lastly, model fitting was measured by log-likelihood tests, comparing explained variances before and after adding worrying to the models. All statistical analyses were conducted using SPSS Statistics 22.

4. Results

The baseline measurement of NESDO included 510 participants. The present study included 475 older adults, since 35 participants did not complete the Worry scale-R and/or the Brugha Questionnaire. Table 1 shows the characteristics of the study sample of the present study. The study sample consisted of three groups; the chronic depressed ($N=93$), the episodic depressed ($N=255$) and the non-depressed ($N=127$) older adults. Analyses showed that the groups did significantly differ in age, but not in sex. Besides this, the chronic and episodic depressed participants reported significantly more negative life-events than the non-depressed

adults, and scored significantly higher on the Worry scale-R than the non-depressed older adults. Next to the differences found in age, the non-depressed reported more years of education, smoked less, did drink more and had more hours of sleep per night in the past four weeks than both chronic and episodic depressed older adults. All of these variables were added to the multinomial logistic regression analyses to adjust for possible confounding. Finally, no differences between the chronic and episodic depressed older adults were found with respect to the number of negative life-events (past five years; $U=11359.50$, $p=.539$). On the Worry Scale-R, however, a statistically significant difference was found: the chronic depressed older adults reported significantly more worrying than the episodic depressed older individuals ($U=8177.50$, $p<.001$).

Table 1

Characteristics of the study sample.

	Chronic depression	Episodic depression	Non- depressed	Test value (df)	p
<i>N</i>	93	255	127		
Socio-demographics					
Age (mean (\pm SD))	69.55 (7.44)	71.23 (7.29)	70.05 (7.00)	$\chi^2=7.25(2)$.027
Female (<i>N</i> (%))	60 (64.51%)	170 (66.67%)	79 (62.20%)	$\chi^2=.757(2)$.685
Years of education (mean (\pm SD))	9.98 (3.54)	10.49 (3.45)	12.55 (3.49)	$\chi^2=38.10(2)$	<.001
Current smokers (<i>N</i> (%))	30 (32.26%)	59 (23.23%)	11 (8.66%)	$\chi^2=19.45 (2)$	<.001
Alcoholic drinks a day (mean (\pm SD))	.55 (.92)	.52 (.80)	1.06 (1.08)	$\chi^2=39.98(2)$	<.001
Hours of sleep a night during past 4 weeks (mean (\pm SD))	7.12 (1.47)	6.97 (1.50)	7.42 (.93)	$\chi^2=8.70 (2)$.013
Psychological stress					
Negative life-events					
Past 5 years (mean (\pm SD))	1.90 (1.53)	1.75 (1.28)	1.27 (1.14)	$\chi^2=15.24(2)$	<.001
Worry scale-R (mean (\pm SD))	9.09 (8.24)	6.16 (7.12)	1.86 (3.98)	$\chi^2=96.57(2)$	<.001

Note. Non-normally distributed continuous variables were compared using Kruskal-Wallis tests, and the categorical variables were compared using Pearson's Chi-Square tests.

4.1 The multinomial logistic regression analysis on the influence of worrying on the association between negative life-events and the chronicity of late-life depression

First a multinomial logistic regression analysis, adjusted for possible confounding, was conducted to examine the association between negative life-events and both chronic and episodic late-life depression (Table 2). This analysis showed that both chronic and episodic depression were significantly positively associated with negative life-events (Model 1). To

examine whether worrying explained the association between negative life-events and (chronic and episodic) late-life depression, worrying was added to Model 1, resulting in Model 2 (Table 2). The study showed that the strength of the association decreased with less than 10% in both chronic and episodic late-life depression, while the associations between negative life-events and (chronic and episodic) late-life depression remained significant. This means that worrying did not explain negative life-events and both chronic and episodic late-life depression.

Table 2

Results of the multinomial logistic regression analysis on the influence of worrying on the association of negative life-events and late-life depression.

	Chronic			Episodic		
	<i>b</i>	OR	CI	<i>b</i>	OR	CI
Negative life-events						
Model 1	.32	1.38*	1.10-1.73	.26	1.29*	1.07-1.56
Model 2	.30	1.35*	1.06-1.72	.25	1.28*	1.05-1.56

Note. OR= Odds Ratio, CI = 95% Confidence Interval. Non-depressed older adults used as reference group, and * $p < .05$. Model 1 shows the association between negative life-events and late-life depression, adjusted for possible confounding, $R^2 = .17$ (Cox & Snell), .20 (Nagelkerke). Model 1 $\chi^2(12) = 88.78$, $p < .001$. In Model 2 worrying is added to the fully adjusted Model 1, $R^2 = .26$ (Cox & Snell), .30 (Nagelkerke). Model 2 $\chi^2(14) = 142.87$, $p < .001$.

In addition, the interaction terms worrying*sex, and worrying*age were subsequently added to Model 2. Statistically significant interaction terms were found for worrying*sex for both chronic (OR=1.20, 95% CI=1.02-1.42, $p = .027$) and episodic (OR=1.21, 95% CI=1.03-1.42, $p = .022$) late-life depression. Besides this, a statistically significant interaction term was found for worrying*age for episodic depression (OR=.99, 95% CI=.98-1.00, $p = .031$), but not

for chronic depression. Further analyses in stratified samples were performed for sex in both chronic and episodic late-life depression, and for two age groups in episodic depression.

4.2 Multinomial logistic regression analyses in stratified samples: sex

The results from the stratified analyses are shown in Table 3a and 3b. The Mann-Whitney Tests showed that females did not significantly worry more than males ($U=23622.50$, $p=.150$), although they were more often exposed to negative life-events than males ($U=22787.50$, $p=.039$). Next, multinomial logistic regression analyses were conducted to examine the influence of worrying on the association between negative life-events and the chronicity of late-life depression for males (Table 3a) and females (Table 3b) separately. As to the males, it was found first of all that the association between negative life-events and episodic late-life depression was statistically not significant (Model 1m). As a consequence, no further analyses were conducted for this group. Next to that, the analysis showed that negative life-events were associated with chronic late-life depression in males, after adjusting for possible confounding (Model 1m). After adding worrying to Model 1m (Model 2m), the strength of the association between negative life-events and chronic late-life depression did decrease with 10%, and the association remained significant. This means that worrying did not explain the association between negative life-events and chronic late-life depression in males, but did influence the association.

Finally, as to females, the analysis showed a statistically significant association between negative life-events and both chronic and episodic late-life depression, after adjusting for possible confounding (Model 1f). After adding worrying to the fully adjusted Model 1f (Model 2f), the association between negative life-events and chronic late-life depression was no longer significant, and the strength of the association did not decrease with 10%. The association between negative life-events and episodic late-life depression in the

female gender remained significant. The strength of the association did not decrease with 10% after adding worrying to the fully adjusted Model 1f. This means that worrying did not explain the association between negative life-events and the chronicity of late-life depression in the female sex.

Table 3a

Result of the multinomial logistic regression on the association between negative life-events, the chronicity of late-life depression and the influence of worrying in males.

	Chronic			Episodic		
	<i>b</i>	OR	CI	<i>b</i>	OR	CI
Negative life-events						
Model 1m	.40	1.50*	1.02-2.20	.14	1.15	.82-1.60
Model 2m	.44	1.56*	1.00-2.42			

Note. OR= Odds Ratio, CI = 95% Confidence Interval. Non-depressed older adults used as reference group, and * $p < .05$. Model 1m shows the association between negative life-events and late-life depression for the male gender, adjusted for possible confounding, $R^2 = .21$ (Cox & Snell), .25 (Nagelkerke). Model 1m $\chi^2(12) = 39.69$, $p < .001$. In Model 2m worrying is added to the fully adjusted Model 1m, $R^2 = .35$ (Cox & Snell), .40 (Nagelkerke). Model 2m $\chi^2(14) = 70.11$, $p < .001$.

Table 3b

Results of the multinomial logistic regression on the association between negative life-events, the chronicity of late-life depression and the influence of worrying in females.

	Chronic			Episodic		
	<i>b</i>	OR	CI	<i>b</i>	OR	CI
Negative life-events						
Model 1f	.31	1.36*	1.02-1.82	.35	1.41*	.82-1.60
Model 2f	.29	1.33*	.99-1.80	.32	1.38*	1.08-1.75

Note. OR= Odds Ratio, CI = 95% Confidence Interval. Non-depressed older adults used as reference group, and * $p < .05$. Model 1f shows the association between negative life-events and late-life depression in the female gender, adjusted for possible confounding, $R^2 = .17$ (Cox & Snell), .20 (Nagelkerke). Model 1f $\chi^2(12) = 57.33$, $p < .001$. In Model 2f worrying is added to the fully adjusted Model 1f, $R^2 = .25$ (Cox & Snell), .29 (Nagelkerke). Model 2f $\chi^2(14) = 87.58$, $p < .001$.

4.3 Binary logistic regression analysis in stratified samples: age

To examine possible differences in two age groups, several analyses were conducted. Age was dichotomized by taking the median age of the older adults in the non-depressed and episodic depressed group as a cut-off point (70 years old). The younger half of the participants was between 60 and 70 years old (Model 1y); the older half of the participants was between the 71 and 93 years old (Model 1o). A Mann-Whitney Test showed that the younger individuals did not significantly worry more than older ones ($U=26868.50, p=.613$).

A binary logistic regression analysis was conducted to examine the influence of worrying on the association between negative life-events and episodic late-life depression in the two age ranges. Table 4 presents the results of the binary logistic regression analysis. The analysis showed that in the age range 60-70 years, negative life-events were statistically significant associated with episodic late-life depression, after adjustment for possible confounders (Model 1y). After adding worrying to the fully adjusted Model 1y, the association between negative life-events and episodic late-life depression was no longer significant but the strength of the association decreased less than 10% (Model 2y). In the age group 71-93 years old, negative life-events were found to be statistically significant associated with episodic late-life depression, after adjustment for possible confounding (Model 1o). After adding worrying to the fully adjusted Model 1o, the association between negative life-events and episodic late-life depression was still significant and the strength of the association did not decrease with 10% (Model 2o). This means that in both age ranges, 60-70 years old and 71-93 years old, the association between negative life-events and episodic late-life depression could not be explained by worrying. The analysis did show that the strength of the association between negative life-events and episodic late-life depression is stronger for people in the older age range, than it is for the individuals in the younger age range. This means that the strength of the association between negative life-events and

episodic late-life depression increased when aging, while both associations could not be explained by the presence of worrying.

Table 4

Result of the binary logistic regression on the influence of worrying on the association of negative life-events and episodic late-life depression with respect to different age groups.

	60-69 years (Episodic)				70-93 years (Episodic)		
	<i>b</i>	OR	CI		<i>b</i>	OR	CI
Negative life-events				Negative life-events			
Model 1y	-.26	.77*	.60-.99	Model 1o	-.37	.69*	.49-.98
Model 2y	-.24	.79	.60-1.04	Model 2o	-.36	.70*	.49-.99

Note. OR= Odds Ratio, CI = 95% Confidence Interval. Non-depressed older adults used as reference group, and * $p < .05$. Model 1y shows the association between negative life-events and episodic late-life depression, adjusted for possible confounding, in the age group 60-70 years, $R^2 = .15$ (Cox & Snell), .21 (Nagelkerke). In Model 2y worrying is added to the fully adjusted Model 1y, $R^2 = .29$ (Cox & Snell), .39 (Nagelkerke). Model $\chi^2(1) = 35.68$, $p < .001$. Model 1o shows the association between negative life-events and episodic late-life depression, adjusted for possible confounding, in the age group 70-93 years, $R^2 = .16$ (Cox & Snell), .23 (Nagelkerke). In Model 2o worrying is added to the fully adjusted Model 1o, $R^2 = .19$ (Cox & Snell), .27 (Nagelkerke). Model $\chi^2(1) = 6.44$, $p < .05$.

5. Discussion

The present study aimed to examine the influence of worrying on the association between negative life-events and the chronicity of late-life depression. It showed, firstly, that worrying did influence the association between negative life-events and chronic late-life depression in males but not in females. Secondly, findings showed that negative life-events were not associated with episodic late-life depression in males. Lastly, results showed that the strength of the association between negative life-events and episodic late-life depression increased when aging.

Our findings are partly in line with our hypothesis. First, it was hypothesized that negative life-events were associated with both chronic and episodic late-life depression.

Previous studies showed that in both sexes, negative life-events were associated with chronic and episodic late-life depression (Fiske *et al.*, 2009). The present study showed that, after adjustment for possible confounding, in females, negative life-events were associated with both chronic and episodic late-life depression, whereas in males, surprisingly, negative life-events were associated with chronic but not with episodic late-life depression, after. This difference between the sexes might be the result of different types of (negative) coping styles that are used by older adults. When an older adult uses a negative coping style in order to deal with a stressor, such as a negative life-event, the stressor gets a more negative appraisal than when dealt with in a more effective way (Folkman, 2010; Korten, 2014; Seaward, 2015). A consequence of this negative appraisal is that the individual experiences more psychological stress, which is known to be associated with late-life depression (Fiske *et al.*, 2009; Gotlib & Hammen, 2009; Pachana & Laidlaw, 2014; Vink *et al.*, 2008). Previous studies showed that many females use negative coping styles to cope with stressors (Golden *et al.*, 2011; Smith & Alloy, 2008). This could explain why in females associations between negative life-events and both chronic and episodic late-life depression were found. And whereas males are known to cope more effectively with stressors than females (Golden *et al.*, 2011; Smith & Alloy, 2008), it is known that in both sexes a depressive mood can lead to a more negative appraisal of a stressor as well (Blazer, 2003; Kraaij *et al.*, 2002; Gotlib & Joorman, 2010). The latter could explain the difference between chronic and episodic late-life depressed males regarding the association with negative life-events and both types of late-life depression. Chronic late-life depressed males, being part of the NESDO database, had already been depressed for at least two years prior to the interview. There is a chance that they were already depressed at the time they were exposed to negative life-event(s), with as a consequence: a more negative appraisal of the (negative) life-event(s) due to the already existing depressed mood of the chronic late-life depressed males. On the other hand, the (currently) episodic late-life

depressed were, presumably, not depressed at the time of exposure to the negative life-event(s) and therefore appraised the negative life-event not as negative as their depressed male peers.

Secondly, it was hypothesized that worrying would explain the association between negative life-events and the chronicity of late-life depression in both sexes. This was hypothesized because worrying is often described as a negative coping style (Dimaggio *et al.*, 2015). In addition, as stated above, previous studies showed that negative coping styles do not only lead to a negative appraisal of the negative life-event, but also made clear that individuals who use negative coping styles in order to deal with such stressors, have a higher chance of developing and maintaining (chronic) late-life depression (Kraaij *et al.*, 2002; Vink *et al.*, 2008). The present study showed that worrying did influence the association between negative life-events and chronic late-life depression in males, and not females. The finding that worrying did influence the association between negative life-events and chronic late-life depressed males is in line with our second hypothesis. However, the finding that worrying did not influence the association of negative life-events and chronic late-life depression in females was unexpected. This latter finding is difficult to explain: studies showed that females tend to cope less effectively with stressors, worry more, are more often depressed, and experience more negative life-events than males (Brock *et al.*, 2011; Folkman, 2010; McGee, 2012; Moore *et al.*, 2015). Therefore it was hypothesized that the influence of worrying was stronger for females than for males and not the other way around. An explanation for this finding could be that this study used a clinical sample. Even though previous studies found that females worry more than males (Brock *et al.*, 2012; Golden *et al.*, 2011), the present study found no such differences. This might be the consequence of the clinical sample used by the present study, whereas previous studies often had a sample representing the general population (Brock *et al.*, 2012). Whereas females are known to worry comparatively much

(Brock *et al.*, 2012; Golden *et al.*, 2011), for males there might be a difference between males as a part of a clinical population and males as a part of the general population. This might indicate that worrying has a stronger association with the (mental) well-being of an older males than older females, and might have a stronger influence on the association between negative life-events and chronic late-life depression in males. A second explanation for the differences between both sexes could be that in females, the association between negative life-events and chronic late-life depression was influenced rather by other negative coping styles than worrying, such as rumination. Whereas worrying is future-oriented, rumination focuses on bad experiences and thoughts and feelings happened in the past, such as negative life-events, and all of the feeling associated with those events (Garneski & Kraaij, 2006; Papageorgiou & Wells, 2004; Smith & Alloy, 2008). Rumination is thus closely related to worrying, but relates to another time-dimension (Watkins, 2005).

Lastly, it was hypothesized that the influence of worrying on the association between negative life-events and the chronicity of late-life depression would decrease when aging. Previous studies showed that the influence of negative life-events on late-life depression declines when aging, and that aging people worry less (Blazer & Hybels, 2005; Brock *et al.*, 2011; Jordanova *et al.*, 2007). However, the main analysis of the present study found no differences for the different age ranges regarding chronic late-life depression. This might be the result of the fact that all respondents were (relatively) old, whereas in previous studies often age ranges covering larger ranges such as middle-aged versus older adults were used as a sample (Turner & Schieman, 2008). Amongst the episodic late-life depressed adults, differences were found between the different age ranges. Interestingly, results demonstrated that when aging, negative life-events were stronger associated with episodic late-life depression than at a (relatively) younger age, whereas it was hypothesized that this effect would decrease when aging. This might be the consequence of the cumulative effect negative

life-events do have on late-life depression (Shira, 2012; Shira & Litwin, 2014). Previous studies have shown that the effect of a negative life-event is partly explained by negative life-events one has been exposed to in the past (Turner & Schieman, 2008). Due to the fact that older adults have a longer life span, it can be assumed that they have been exposed to more negative life-events during their lifespan than the younger adults. Lastly, it was found that worrying did not explain the association between negative life-events and episodic late-life depression in both age ranges. This is in line with the second part of the third hypothesis.

5.1 Strengths & limitations

This study has several limitations and strengths that need to be mentioned. The first limitation is that it used a cross-sectional design. Therefore no conclusions regarding the causality of the association between negative life-events, worrying and late-life depression could be drawn. A possible limitation might relate to the fact that the older adults reported the age of onset of depression in retrospect: they might give unreliable information regarding current or possible earlier depressive episodes. Reporting in retrospect could have led to unreliable data regarding the actual age of onset of depression.

The first strength of the present study is the large sample size of the chronic, episodic and non-depressed older adults. The second strength is that we were able to adjust the logistic regression analyses for many relevant variables for possible confounding. The third strength is the large age range of the older adults included in the research. So far, not many studies included adults covering an age range as large as sixty to ninety-three years old. A final strength of this study relates to its contribution to the establishment of a broader framework regarding the influence of worrying on the association between negative life-events and chronic late-life depression in males. Further to that it provides more insights into the sex

differences regarding the association between negative life-events and episodic late-life depression in a clinical setting.

5.2 Clinical relevance

The outcomes of the present study are of clinical relevance: they suggest that there are indeed differences between both sexes and different age ranges regarding late-life depression in a clinical population. Firstly, the present study showed that worrying did influence the association between negative life-events and chronic late-life depression in males in a clinical population. This is of interest because worrying is considered to be a treatable factor (Richardson & Barusch, 2013). Besides this, the present study suggested that there are indeed differences between both sexes in factors associated with both chronic and episodic late-life depression, while, based on previous studies, the differences between negative life-events and episodic late-life depression were not expected (Fiske *et al.*, 2009). Thirdly, previous studies showed that the effects of exposure to negative life-events decreases when aging (Blazer & Hybels, 2005; Jordanova *et al.*, 2007; Mazure & Maciejewski, 2003; Neupert *et al.*, 2007), while the present study showed that the association of negative life-events and episodic late-life depression did rather increase than of decrease when aging. These findings contribute to a better understanding of the functioning of older adults, exposed to difficult, yet common, events in daily life. Such a better understanding can hopefully help the mental healthcare with the improvement of prevention and intervention methods, thus reducing the risk of developing and maintaining depression amongst older individuals. All of this can be done with the aim of improving the quality of life of older adults after facing such events.

5.3 Future research

In order to develop a broader framework regarding the chronicity of late-life depression and to further develop specific preventive and intervention programs for depressed older adults more research is needed. First, future research could use a longitudinal design instead of a cross-sectional design. Secondly, future research could examine negative life-events in combination with other negative coping styles, such as rumination. Thirdly, future research could examine the influence of the mood of older adults on their use of (negative) coping styles regarding coping with stressors.

5.4 Conclusion

In conclusion, the present study showed some interesting results regarding differences between both sexes and different age ranges. Firstly, it became clear that worrying did influence the association between negative life-events and chronic late-life depression in males but not in females. Secondly, whereas in females negative life-events were associated with both chronic and episodic late-life depression, after adjustment for possible confounding, this association was not found for negative life-events and episodic late-life depression in males. Lastly, the strength of the association between negative life-events and episodic late-life depression increased with age. These findings can hopefully help with the improvement of the treatment of depressed older adults.

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