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Positive life events and mood disorders: Longitudinal evidence for an erratic lifecourse hypothesis

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ABSTRACT

Background: An unresolved issue in psychiatry research concerns the assumption that detrimental effects of negative life events on mental health may be buffered by a multitude of positive life events. However, there is clear lack of empirical evidence for this assumption, and one may even argue that positive life events act as additional stressors and thus increase (and not decrease) the risk for affective disorders.
Methods: Data were used from 4796 adults aged 18–64, who participated in 2 waves (i.e., 1997 and 1999) of NEMESIS, a prospective-epidemiological study. Measures were based on diagnoses of DSM-III-R mood disorders, and a life events questionnaire employed in the NEMESIS study.
Results: Although the prevalence of mood disorders correlated positively with both the number of negative and positive life events experienced, a multivariate path analysis (Mplus) demonstrated that only negative life events longitudinally predicted mood disorders. Positive life events predicted subsequent mood disorders only when in the same time period a high number of negative events were experienced.
Conclusions: Positive life events do not buffer the detrimental impact of negative ones, but instead may function as additional stressor, in the context of highly erratic life course patterns that may be typical for depressed individuals.

It is well-known that negative events oftentimes evoke stronger 'mobilization' or stress responses than positive ones (Chan, 1998; Wells et al., 1999), and that their impact on people's mental health wears off more slowly than that of positive life events (Taylor, 1991). In accordance, the link between the occurrence of negative life events and unipolar affective disorders is clearly established (Mitchell et al., 2003). No previous epidemiological study, however, has examined whether 'bad' –negative life events– is stronger than 'good' –positive life events– with regard to clinical-level depression in a general population. Another unresolved issue concerns the assumption that the detrimental effects of negative life events on mental health may be buffered by a number of positive life events (e.g., Baumeister et al., 2001). In this study, we oppose this *power of numbers* hypothesis, instead arguing that positive life events, when they are a part of an erratic lifecourse pattern, function as additional stressors and thus increase the risk for mood disorders.

1. Positive life events: harmful?

From an evolutionary perspective, scholars have argued that attentiveness to cues of pain or danger in the environment provides humans with an evolutionary advantage – in contrast with positive cues, that do not provide an advantage in the survival of genetic material (Baumeister et al., 2001). However, because most studies focused exclusively on the risks associated with negative life events, findings on the relative impact of negative versus positive life events are scarce. Wells et al. (1999) found that among 89 pregnant women resource losses were more strongly linked to *post-partum* depression than resource gains. Chan (1998), studying a sample of 745 adolescents, found that negative events had twice the impact of desirable events on interpersonal problems in school, or with family and friends. Some prospective studies conducted in the 1980s examined whether positive life events had separate main effects on mental health outcomes, apart from any negative life events, but did not find significant linkages between positive life events and sub-clinical

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levels of psychological stress or depressive mood (Swearingen and Cohen, 1985; Cohen et al., 1987). Finally, a more recent analysis of NEMESIS data demonstrated that experiencing one or more positive life events, when controlling for the number of negative life events experienced, did not increase the risk for the onset of mood disorders (De Graaf et al., 2002).

These findings are oftentimes explained by stating that positive life events may not be directly, but rather indirectly related to the occurrence of mood disorders. That is, the detrimental impact of negative life events on mental health may be buffered by a multitude of positive events – a perspective known as the *power of numbers* hypothesis (Baumeister et al., 2001). Although this is an intuitively appealing viewpoint, the empirical evidence behind it is unconvincing. To our knowledge, only one study (Cohen et al., 1987) reported a significant longitudinal buffer effect of positive life events, and then only in one of three dependent variables measured (i.e., self-esteem), and only in females. The empirical evidence, limited at best, is also at odds with research that shows that despite their positive emotional valence, positive life events can be stressful experiences. The birth of a child or moving into a new house, for example, are linked to feelings of happiness and joy, but may also lead to elevated levels of stress (Cornille, 1993; Lu, 2006). Such heightened stress levels may be associated with many of the somatic core symptoms for mood disorders (i.e., change in sleep and feeding patterns, concentration difficulties, irritability) and with lower well-being and flat affect.

2. An erratic lifecourse hypothesis

Positive life events might thus be associated with a *higher*, instead of lower risk for mood disorders. How can we explain that? We put forward that people who suffer from clinical-level depression follow more chaotic, less stable lifecourse trajectories compared with people who are not suffering from depression. This can be explained by the fact that depressed individuals experience more problems in maintaining meaningful relationships with others, such as partners (Maughan and Taylor, 2001; Overbeek et al., 2003), and to carry responsibilities in the domains of school and work (Kruijshaar et al., 2003). In an erratic lifecourse, negative events can be directly followed-up by positive life events (Reich and Zautra, 1981), and *vice versa*. For example, people who lose their job or experience a divorce –examples of negative life events– are not only at higher risk for the development of mood disorder (De Graaf et al., 2002; Mitchell et al., 2003), but also have a higher likelihood of finding a new job and entering a new partner relationship. Thus, positive life events are interwoven in the mutually reinforcing connection between negative life events and depression.

The erratic lifecourse hypothesis holds that positive life events *an sich* do not lead to higher risks for the development of mood disorders; the direct 'effect' of positive events on our mental health will probably be much weaker than that of negative life events (Baumeister et al., 2001; Taylor, 1991). However, we *do* expect that the stress potential of positive life events is expressed when individuals experience a very high number of negative life events. In contrast with the *power of numbers* hypothesis, this would mean that positive events do not buffer the detrimental effects of negative life events, but rather amplify them. In already 'eventful' periods (for instance, in which one has recently divorced and consequently had to move) a positive event, such as the birth of a child, will be predominantly perceived as a stressor. Individuals' stress-response system, already highly burdened by a high number of negative life events, will not be able to adequately deal with yet another major life change. This will increase an individual's psychological stress and thus the risk that a mood disorder will develop.

3. Objectives of the study

This study examined the erratic lifecourse hypothesis based on data from 4796 adults (18–64 years) from the general population, who participated in two measurements (1997 and 1999) of the Dutch NEMESIS study. The research questions were: (1) are positive life events associated with an elevated risk for the development of mood disorders?, and (2) is the association between positive life events and mood disorders explained by the number of negative life events that someone experienced? Related to the first question, we hypothesized that individuals' reports of positive life events would be related to the subsequent prevalence of mood disorders. However, we also hypothesized that in a multivariate analysis, when controlling for the number of negative events someone reported, this link would disappear. With regard to the second question, we assumed that there would only be a significant association between positive life events and mood disorders when individuals had also experienced high numbers of negative life events. Also based on a erratic lifecourse perspective, we hypothesized that mood disorders would be predictive of subsequently higher numbers of negative and positive life events experienced, and that people who reported to have experienced more negative life events would likely experience more positive life events subsequently, and *vice versa*.

4. Materials and methods

4.1. Procedure

All subjects who took part in NEMESIS (the Netherlands Mental Health Survey and Incidence Study) were selected using a multistage, stratified, random sampling procedure. First, a sample of 90 Dutch municipalities was selected based on the level of urbanization and dispersion over the 12 provinces of the Netherlands. Second, a sample of private households was drawn from post office registers. Third, selected households were sent a letter of introduction and contacted by telephone shortly after (households without telephones or with unlisted numbers were visited in person). In all households, members with the most recent birthday were selected, on the condition that they were between 18 and 64 years old and sufficiently fluent in Dutch to be interviewed. Respondents who were not immediately available due to circumstances such as hospitalization or imprisonment were contacted again later in the year. Respondents were interviewed in person, and received a small token of appreciation at the end of the interview. In total, 7076 individuals were interviewed at the first wave in 1996, an initial response rate of 70%. This baseline-sample was representative for the Dutch population in terms of sex, marital status, and degree of urbanization. Of all respondents that were interviewed at baseline, 5618 (79%) were interviewed again at the second wave in 1997, and of these a total of 4796 (85%) were interviewed again in the third wave in 1999. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki, and the study design was reviewed by an appropriate ethical committee and approved and funded by the Dutch ministry of Health, Welfare, and Sports.

4.2. Sample characteristics

Since information about the occurrence of life events was available only at the second and third waves, we excluded the baseline data from the analyses. In total, 4796 adults participated in each of the two waves (1997 and 1999) used in our analyses. For reasons of clarity, we will refer to 1997-data as T_1 and to 1999-data as T_2. At T_1, the sample consisted of 2233 males (46.6%) and 2563 females (53.4%). A total of 335 participants (7.4%) were 18–24 years

old; 1245 (26.0%) were aged 25–34 years; 1342 (28.0%) were 35–44 years; 1069 (22.3%) were 45–54 years; and 805 (16.8%) were 55–64 years. Mean age at T_1 was 41.2 ($SD = 11.9$ years). A total of 257 respondents (5.4%) had finished primary school, 1720 (35.9%) had completed lower vocational or general education in secondary school, 1368 (28.5%) had finished average to high vocational or general education in secondary school, and 1451 (30.3%) had completed professional or scientific studies. Attrition analyses of data from the NEMESIS project between 1996 and 1997 have previously been reported (De Graaf et al., 2002). Across the present 2-year time interval between 1997 and 1999, attrition was shown to be more prevalent among young adults [$OR = 0.89$, $p \leq .001$] and people with lower educational level [$OR = 0.76$, $p \leq .001$]. No selective attrition was found with regard to the presence of mental disorders or negative life events one year prior to 1997.

4.3. Measures

4.3.1. DSM-III-R mood disorders

Diagnoses were based on the Diagnostic and Statistical Manual of Mental Disorders, third revised edition (DSM-III-R). The instrument used to determine the diagnoses was the Composite International Diagnostic Interview, computerized version 1.1 (CIDI; Smeets and Dingemans, 1993b), which is a structured interview developed by the World Health Organization on the basis of the Diagnostic Interview Schedule (DIS) and the Present State Examination (PSE), and was designed to be used by trained non-clinician interviewers. The CIDI has been employed in studies worldwide, and WHO research provided evidence for a high inter-rater reliability as well as a high test-retest reliability (Wittchen, 1994), and an acceptable validity for different affective disorders (Farmer et al., 1990). We assessed 1-year prevalence rates for diagnoses of mood disorders (i.e., major depressive disorder, bipolar mood disorder and dysthymia) at T_1 (1997) and T_2 (1999). We deliberately focused on prevalence rates, as the erratic lifecourse hypothesis would not only explain onset, but also any recurrent or stable form of depression.

4.3.2. Negative and positive life events

Information was collected on people's reports of the negative and positive life events they experienced. Positive and negative life events were of identical nature, and considered: (1) favourable/adverse changes of health condition, (2) favourable/adverse changes of health condition significant other, (3) favourable/adverse changes in important life domains – such as being fired versus finding a new job, or getting married versus getting divorced, (4) favourable/adverse changes in important life domains significant other, (5) favourable/adverse changes in living conditions, (6) anticipated favourable/adverse events in the near future, (7) attainment/failure to attain major personal life goals, (8) other important favourable/adverse life events, (9) other major favourable/adverse life events significant other. For each of these domains, participants reported whether they had experienced one or more events in the directly preceding time period of 1 year (at $T_1 - 1997$) or 2 years (at $T_2 - 1999$). Participants also rated the extent to which they felt a given life event had severe or less severe consequences for their well-being on a 3-point scale (0 = not important, 1 = a little important, 2 = very important).

4.4. Strategy of analyses

Since only a limited number of people appeared to have experienced between six and nine negative ($n = 21$) or positive ($n = 71$) life events, we decided to collapse these scoring categories into one overarching category of 'six or more life events' experienced by the participants. By means of logistic regression analyses, we then investigated relationships between negative and positive life events at T_1 and subsequent affective disorders at T_2, controlling for sex, age, and educational level. Finally, we specified a multivariate path model using Mplus 4.2 (Muthén and Muthén, 1998). In this 2-wave model, all bidirectional-longitudinal linkages were estimated between negative and positive life events and mood disorders. Because the model variables were binary or count variables and highly skewed, the parameters of the model were estimated with the weighted least squares (WLS) method. We estimated the parameters of the cross-lagged path model controlling for the effects of sex, educational level, and age at T_1.

5. Results

5.1. Descriptive statistics

About 58% of all participants had experienced at least one negative life event in the period directly before T_1. More specifically, 33.6% ($n = 1612$) had experienced one negative life event, 14.7% ($n = 705$) two, 6.2% ($n = 299$) three, 2.2% ($n = 105$) four, 0.7% ($n = 34$) five, and 0.4% ($n = 21$) had experienced six or more. Also, about 67% had experienced a positive life event in the period directly before T_1. More specifically, 27.1% ($n = 1300$) had experienced one positive life event, 19.2% ($n = 919$) two, 11.1% ($n = 532$) three, 5.2% ($n = 247$) four, 2.6% ($n = 127$) five, and 1.5% ($n = 71$) had experienced six or more. At T_1, moreover, 5.7% of the sample ($n = 274$) was diagnosed as suffering from a mood disorder. A t-test showed that participants diagnosed with a mood disorder had experienced more negative (1.84 versus 0.91 $|t(289.11) = -9.84$, $p < .001$), but also more positive events (1.92 versus 1.38 $|t(297.14) = -5.24$, $p < .001$) than participants without a diagnosis of mood disorder. In addition, Pearson correlations demonstrated that people experiencing more negative life events, either at T_1 or T_2, also reported higher numbers of positive life events [$r = 0.25$, $p < .001$ at T_1; $r = 0.29$, $p < .001$ at T_2].

5.2. Logistic regression analyses

The outcomes of the logistic regression analyses (Table 1) indicated that over a 2-year time interval –and controlling for sex, age, and education level– the number of negative events experienced at T_1 was more strongly associated with the prevalence of mood disorders at T_2 than the number of positive life events experienced at T_1. With an increasing number of negative life events at T_1 the subsequent likelihood of being diagnosed with a mood disorder at T_2 increased sharply, with people who experienced six or more negative life events being almost ten times more likely to be diagnosed than people in the baseline "no event" category. Nevertheless, and as hypothesized, a higher number of positive life events reported by the participants (not controlling for negative life events they had experienced) was also significantly related to increased risk for mood disorders across the 2-year time interval. People who, at T_1, had experienced six or more positive life events were more than three times as likely to be diagnosed with mood disorder two years later compared to people who had not experienced any positive life event. The regression models did not explain a large portion of mood disorders in the sample: *Nagelkerke* $R^2 = 0.05$ for negative events and $R^2 = 0.02$ for positive events.

5.3. Mplus path analyses

Results from the Mplus path analyses (Fig. 1) made clear that, as hypothesized, individuals who reported to have experienced a relatively high number of negative or positive life events at T_1 were more likely to also report higher levels of negative and positive life events,

Table 1
Odds ratios and 95% confidence intervals in logistic regression of mood disorders at T_2 on negative and positive life events at T_1.

	Negative Life Events T_1			Positive Life Events T_1		
	N (%)	Odds Ratio	95% CI	N (%)	Odds Ratio	95% CI
Sex (0 = male; 1 = female)		1.67***	1.23–2.86		1.73*	1.65–1.88
Age		0.93	0.81–1.56		0.97	0.81–1.08
Educational Level		0.94	0.85–1.54		0.94	0.83–1.07
One Event	1622 (33.3%)	1.30	0.95–1.81	1300 (27.1%)	1.02	0.72–1.45
Two Events	705 (14.7%)	2.18***	1.52–3.12	919 (19.2%)	1.51*	1.06–2.15
Three Events	299 (6.2%)	3.21***	2.10–4.92	532 (11.1%)	1.47†	0.96–2.25
Four Events	105 (2.2%)	5.33***	3.04–9.34	247 (5.2%)	2.00**	1.21–3.32
Five Events	34 (0.7%)	5.41***	2.16–13.55	127 (2.6%)	1.81†	0.90–3.62
Six$^+$ Events	21 (0.4%)	9.89***	3.70–26.44	71 (1.5%)	3.40***	1.66–6.97

Note: 95% CI = 95% Confidence Interval; Odds ratio reflects deviance contrast with a baseline "no event" group ($N_{PLE} = 1600$; $N_{NLE} = 2020$); −2 $LogLikelihood_{NLE} = 2008.76$, −2 $LogLikelihood_{PLE} = 2059.05$, †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$.

respectively, at T_2. The results (not in Figure) furthermore showed that at T1 mood disorders were more prevalent among females than among males ($\beta = 0.21$, $p < .001$), and that with increasing age participants reported more positive life events at T_1 ($\beta = 0.20$, $p < .001$) and T_2 ($\beta = 0.17$, $p < .001$). Participants from higher educational backgrounds also reported more positive events at T_1 ($\beta = 0.10$, $p < .001$).

Controlling for participants' socio-demographic background as well as the co-occurrence of positive and negative life events with mood disorders at T_1, significant cross-lagged associations emerged across a 2-year time interval from negative life events at T_1 to mood disorders at T_2 and, *vice versa*, from mood disorders at T_1 to negative life events at T_2. This demonstrated that individuals who experienced more negative life events were at higher risk for mood disorders in the directly following 2-year time period, and that individuals diagnosed with a mood disorder subsequently experienced more negative life events. Mood disorders at T_1 were also positively related to the occurrence of positive life events at T_2. However, individuals' reports of positive events at T_1 were not significantly related to subsequent affective disorders at T_2. Finally, negative and positive life events were found to be significantly and positively associated with each other over time. This means that participants who reported to experience more negative life events at T_1 also reported higher levels of positive life events two years later at T_2 – and *vice versa* reported more negative life events at T_2 if they had earlier experienced more positive life events at T_1. Based on this model, we were able to explain 30% of the variance in mood disorders, 15% of the variance in negative events, and 23% of the variance in positive events at T_2.

Next, we examined possible moderator effects, more specifically in terms of life event appraisals at T_1 (i.e., in terms of perceived impact on mental health) and the time elapsed since the occurrence of the life event before T_1. These analyses made clear that neither the individual appraisals of life events, nor the time passed since these events occurred attenuated the life event-disorder relationships. However, and as expected, the association between positive life events and mood disorders *was* moderated, by the number of negative life events participants had experienced ($OR = 0.95$, $p < .05$, 95% $CI = 0.90–0.99$; see Fig. 2). In a post-hoc examination of an at-risk subgroup of participants who experienced a high number of negative events (five or more) during the same time period, positive events –a cut-off score for positive life events was chosen of 2 SD above the mean, targeting the 4.1% highest scores ($n = 198$) in the population– were more strongly associated with an increased risk for the occurrence of mood disorders. For people who did not experience such a high number –four events or less– of negative life events, this association did not exist.

6. Discussion

The results of the present study demonstrate, first of all, that both higher numbers of negative and positive life events were associated with an increased risk of being diagnosed with mood disorder over a 2-year time interval. However, the multivariate path analysis in Mplus demonstrated that, when controlling for the negative events participants had experienced, positive life events at T_1 were not significantly related to the subsequent occurrence of mood disorders. In line with the erratic lifecourse hypothesis, the

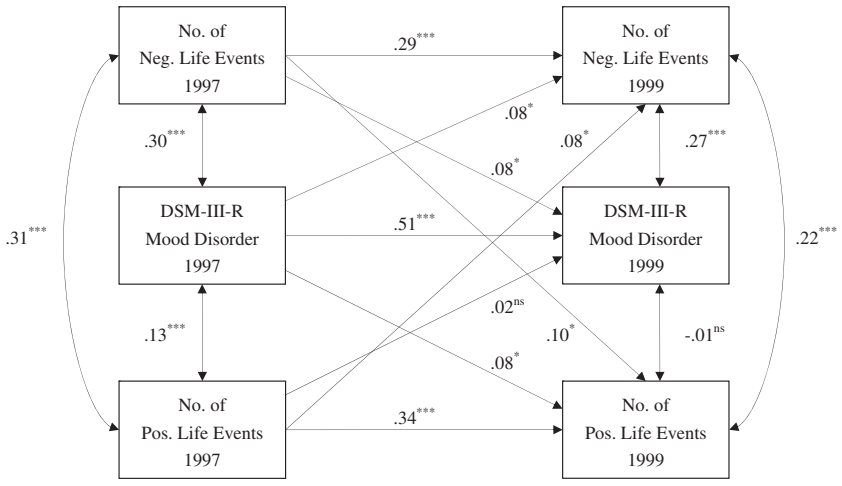

Fig. 1. Weighted least squares (WLS) estimates in Mplus. Note: $\chi^2(9) = \chi^2(9) = 12.879$, $p \leq .168$; $CFI = 0.999$; $RMSEA = 0.009$.

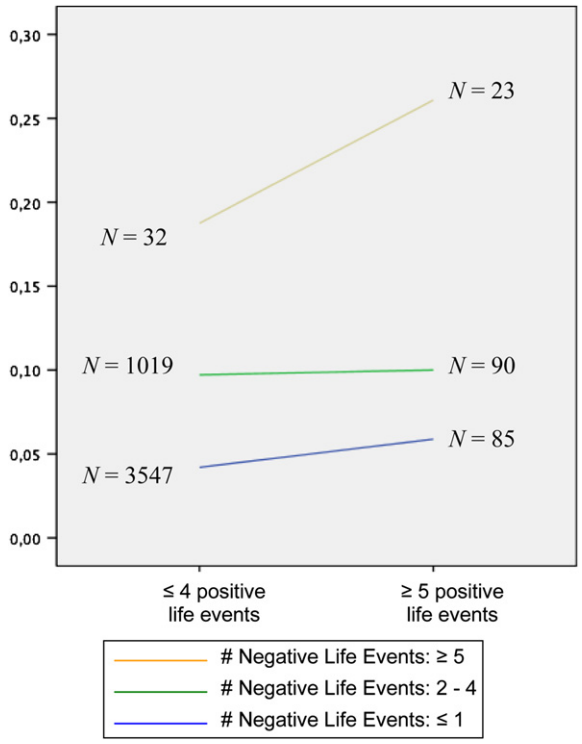

Fig. 2. proportion mood disorders (*Y*-axis) explained by interaction of positive × negative life events.

results showed that people who reported more negative life events at T_1 had a subsequently higher likelihood of experiencing positive events at T_2, and *vice versa* reported more negative life events at T_2 when they had experienced more positive events in the two-year time interval before. Finally, a significant moderator effect showed that positive life events were only associated with mood disorders when accompanied by a very high amount of negative events during the same time period.

6.1. Positive life events in an erratic lifecourse

The results of the present study show that the likelihood of experiencing positive events was higher for people diagnosed with mood disorder. A possible explanation for this might be that when people suffer from severe emotional problems, their social support system 'jumps in' and helps them to more adequately cope with their situation, increasing the likelihood of a positive event (Reich and Zautra, 1981), such as attaining an important personal goal. A perhaps more valid explanation is that depressed people do not only experience more negative life events, but follow a more disorganized lifecourse trajectory in which negative events (for instance breaking up with one's partner), and positive events (for instance, entering a new relationships) constantly alternate. In fact, this last explanation is endorsed by the present results, which show that there is a mutually reinforcing longitudinal relationship between negative and positive life events over a 2-year time interval. Another piece of evidence for the erratic lifecourse hypothesis is that we found that positive life events are only related to the prevalence of DSM-III-R mood disorders when they are accompanied by a culmination of negative life events at the same time. This explains why positive life events at T_1 are not predictive of subsequent mood disorders, but *vice versa*, mood disorders at T_1 *can* be predictive of the subsequent likelihood of positive events to occur.

6.2. Looking at some alternative explanations

It is important to try to exclude several alternative explanations that may just as well explain why positive life events are associated with an increased risk for mood disorders and at the same time are related to experiencing more negative life events. First of all, one might argue that the positive correlations emerged due to the tendency in participants to mentally 'compensate' for the number of bad things that happened to them by mentioning more positive events as well in the structured interview. We were able to establish, however, that this alternative explanation did not apply, for in the multivariate path analysis we controlled for the reported number of negative life events. Even when partialling out this association with negative life events, positive events were still significantly, cross-sectionally associated with the presence of mood disorders in participants.

Another, more adequate, explanation then might be that some 'third' variable explained the associations. Specifically, based on high levels of emotional instability or neuroticism, some individuals will have a tendency to ruminate and doubt their decisions in life, and to be pessimistic about their future. This tendency towards emotional instability and rumination may put certain individuals at increased risk for the development of mood disorder, but at the same time increase the likelihood of experiencing a multitude of life events, both positive and negative. In order to rule out this second alternative explanation, we conducted partial correlation analyses taking individuals' neuroticism —based on the neuroticism subscale of the Amsterdam Biographical Questionnaire (ABV; Ormel and Rijsdijk, 2000)— as a third variable. The results showed that individuals' neuroticism did not attenuate the significant positive associations between positive and negative life events and mood disorders.

6.3. Strengths and limitations of the study

The present study contributes to our understanding of the impact of life events by providing a prospective, multivariate analysis in a representative, large-scale epidemiological study. However, several limitations also need to be mentioned. First of all, we used a customized life events questionnaire for the NEMESIS study that operated with categories of life events rather than separate counts of such life events. Thus, individuals could report whether they had experienced 'one or more' event(s) in a life event category. Although it seems unlikely that more than a small minority of individuals would have experienced more than one event per category, we may have underestimated the strength of cross-lagged associations between diagnoses of mood disorders and life events. Another limitation of the instrument is that it predefines what are 'positive' and 'negative' events. We therefore cannot exclude the possibility that duration of life stress, as well as time order and context effects may have biased some of our results. For instance, a divorce —defined as a negative event in our study— that ends an abusive relationship may in some extreme cases even be perceived as a positive instead of a negative event by the individual involved. This shows that data from the present large-scale, 2-wave longitudinal design need to be qualified in future studies that tackle this problem of 'intracategory variability', by focusing on shorter time intervals (i.e., weeks or months) and by using a narrative approach that takes into account the specific contexts and time order in which life events occur (e.g., Brown et al., 1993; Dohrenwend, 2006).

Another limitation is that we exclusively relied on psychopathology as an outcome measure. Future research may benefit from a broader focus on positive outcomes too, as it might be the case that reports of positive events may be strongly associated with positive but not negative affect (Seligman et al., 2005). Finally, genetic vulnerability for affective disorders was not assessed. This

limits the generalizability of our present findings, as the linkages between stressful life events and mood disorders may be partly explained by a shared genetic risk in people for both exposure to stressful life events and depressive symptoms (Kendler et al., 1999).

Despite these limitations, in our view the present results do offer several important new insights into the impact of stressful life events. The first, contrary to popular belief, is that positive life events are not associated with a lower risk for the prevalence of mood disorders to occur. The second is that positive life events do not buffer against the harmful effect of negative life events, but instead –as an integral part of an erratic lifecourse– may amplify this harmful effect.

Contributors

Geertjan Overbeek analyzed the data in SPSS and Mplus, and wrote the present paper as first author. Ron de Graaf is the present PI on the NEMESIS research project, and co-authored the paper, providing written feedback and intellectual input. Ad Vermulst handled the more detailed Mplus analytical procedure, and co-wrote the texts on Mplus analytical strategies in the paper. Margreet ten Have, Ron Scholte, and Rutger Engels were involved in providing feedback on earlier versions of the paper and co-authored parts of the introduction and discussion sections of the present paper, also providing intellectual input.

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Conflict of interest

There are no conflicts of interest for the authors that have collaborated in the present study, and participated in the preparation of this manuscript.

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