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## THE EFFECTS OF OPTIMISM, PESSIMISM, SOCIAL SUPPORT, AND MOOD ON THE LAGGED RELATIONSHIP BETWEEN DAILY STRESS AND SYMPTOMS

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### ABSTRACT

We investigated the relationship between the daily stress of minor events and subsequent symptoms of upper respiratory tract infections (URTIs). Optimism, pessimism, and social support were considered as possible moderators, and anxious and composed mood as potential mediators, of the stress-URTI relationship. Participants were 125 undergraduate students who completed measures of optimism, pessimism, social support, and negative affectivity and a daily diary of interpersonal hassles and uplifts, URTI symptoms, and anxious and composed mood over a fixed seven-day period. Interpersonal hassles related to later symptoms among people with a small network, but not among those with a large network. Mood did not mediate the relationship between interpersonal hassles and URTI symptoms, although interpersonal hassles and uplifts related to same-day mood. Interpersonal hassles seem to be particularly important for current mood and later somatic outcomes, whilst support network may act as a buffer in this context.

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### INTRODUCTION

It has been well documented that psychosocial factors play a part in causing disease (e.g., DeLongis, Folkman and Lazarus 1988). Considerable research has shown the link between stress and subsequent somatic illness, particularly upper respiratory tract infections (URTIs) (see

Steptoe and Cohen 1999). These infections are some of the most widespread causes of acute illness and include sinusitis, laryngitis, and of course the common cold and influenza.

Recent studies have generally focused on either the laboratory-based link between stress and infection after artificial introduction to viruses or the prospective relationship between the stress of minor events and naturally occurring URTIs. Minor events are situations that occur on a daily level which may be interpreted as distressing hassles (e.g., traffic jams, inclement weather, arguments) or eustressing uplifts (e.g., a good nights sleep, good news) (Kanner et al. 1981). Daily investigations have shown that experiencing hassles relates to somatic symptoms three to four days later (Sheffield, McVey and Carroll 1996). Similarly, an increase in hassles (Stone, Reed and Neale 1987) and a decrease in uplifts (Evans and Edgerton 1991; Evans, Pitts and Smith 1988; Stone et al. 1987) have been found to precede URTI symptoms by four days. This three to four-day lag corresponds with the incubation period of many common viruses known to cause URTIs, although, for some viruses, symptom peak occurs as early as two days following exposure (see Tyrell, Cohen and Schlarb 1993).

Certain subscales of minor events have been shown to be particularly important in the stress-URTI relationship. Specifically, interpersonal minor events have been linked to subsequent URTI symptoms where other types of minor events have not (Evans and Edgerton 1991; Lyons and Chamberlain 1994, 1998); therefore we chose to focus on these types of events. Additionally, Cohen et al. (1998) found chronic interpersonal life-events to be especially powerful for predicting infection after exposure to an URTI virus. However, this effect may be due to minor events which have been shown to mediate the effects of life-events (Pillow, Zautra and Sandler 1996), but which were not assessed in Cohen et al.'s (1998) study. Interpersonal events may be particularly relevant because social interactions can elicit large changes in both physiological responses (see Cacioppo 1994) and emotional state (Stone 1987).

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Particular individual factors may moderate the daily stress-URTI relationship. As DeLongis et al. point out, "persons with low psychosocial resources are vulnerable to illness and mood disturbances when their stress levels increase" (1988:486). Strong evidence suggests that social support is one such moderator (Affleck et al. 1994; Cohen and Wills 1985; DeLongis et al. 1988; Ogden and Mtandabari 1995; Turner Cobb and Steptoe 1996, 1998; Tyler and Cushway 1995), although it is currently unclear which specific aspect of support is beneficial, and in which contexts. Particularly, Cohen and Wills (1985) assert that quality of support is important when people experience stress, although other research indicates that support network size moderates the stress-URTI relationship (Turner Cobb and Steptoe 1996). Prospective daily studies may help to clarify this, and we propose that social support may be particularly relevant in the context of daily interpersonal stress.

Dispositional optimism has also been found to moderate stress responses (e.g., Scheier, Weintraub and Carver 1986). Some debate exists over whether optimism and pessimism are ends of a continuum or two distinct constructs (e.g., Marshall et al. 1992; Peterson 2000; Scheier, Carver and Bridges 1994). In their study investigating URTIs in a student population, Lyons and

Chamberlain (1998) found that low levels of dispositional pessimism, and not high optimism, influenced the effects of minor events on later URTI symptoms.

It is currently unclear how daily stress might affect URTIs. A direct biological link is plausible via reduction of secretory immune responses, which ordinarily protect the respiratory tract during a viral challenge, but which can be influenced by stress (see Cohen 1995). Changes in mood have also been related to secretory immune responses (Stone et al. 1994, 1996), therefore mood is a potential mediator of the stress-URTI relationship. Furthermore, studies have shown relationships between mood and later URTIs. For example, Evans and Edgerton (1991) found that compared to an illness-free control period, tension was related to URTI symptoms four days later. Similarly, Cohen et al. (1995) found that high anxiety before an induced viral challenge led to increased symptom reports, while Cohen, Tyrrell and Smith (1991) found that negative mood (as part of a stress index) over the week preceding a viral challenge was predictive of infection in a dose-response manner.

In support of the first stage of the proposed mediation effect of mood, many studies have shown daily stress to be associated with worse concurrent mood (Affleck et al. 1994; David et al. 1997; DeLongis et al. 1988; Marco et al. 1999; Stone et al. 1987; van Eck, Nicolson and Berkhof 1998). Specifically, interpersonal hassles and uplifts have been found to be directly related to mood (Bolger et al. 1989; Cimboric Gunthert, Cohen and Armeli 1999; Flory et al. 2000; Jones and Fletcher 1996; Stone 1987).

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In terms of particular mood states, anxiety seems to be especially important. For example, increased anxiety has been related to life-event stress (Ogden and Mtandabari 1995), as well as relatively minor daily stress (Jones and Fletcher 1996, Steptoe and Wardle 1998). Similarly, van Eck et al. (1998) have shown that the occurrence of a stressful minor event throughout the day is related to increased agitation and anxiety. Thus it may be beneficial to assess specific mood states, such as anxiety and its positive counterpart, composure, in order to understand the stress-mood-URTI pathway more fully. Further, both positive and negative mood states are important to examine, as negative aspects of mood have been shown to be independent of positive aspects of mood (e.g., Watson et al. 1999).

The major aim of the present study was to replicate previous findings (e.g., Evans and Edgerton 1991; Sheffield et al. 1996) of a two- to four-day lagged relationship between interpersonal minor events and URTI symptoms using a diary design. The study also examined whether the stress-URTI relationship is moderated by the psychosocial resources of optimism, pessimism, or social support, and/or mediated by anxious or composed mood. Specifically, we expected that interpersonal hassles would increase later URTI symptoms through heightened anxiety, whilst interpersonal uplifts would decrease later URTI symptoms through increased composure. Data were collected daily for seven days, and for exploratory purposes we examined whether minor events increased or decreased on the weekend. As the present study is based on self-reported symptoms, events, and mood, a measure of negative affectivity (also referred to as neuroticism or trait anxiety) was included to control for individuals' propensity to experience greater mood

reactivity (McCrae and Costa 1986) and to report increased physical symptoms (Cohen et al. 1995).

## **METHOD**

### **Participants and Procedure**

Participants were university undergraduate students who were approached in meetings at a hall of residence and classes. Participants were asked to complete psychosocial measures and provide demographic information in their own time, and were given a diary with instructions to fill it in during the early evening across one of two specific seven-day intervals running from a Friday to a Thursday. Both intervals were during the month of October in an attempt to maximise exposure to URTIs (see Monto and Sullivan 1992).

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Out of 190 people who initially agreed to take part in the seven-day study, 130 (68%) returned their diaries. Of these 130 people, 125 (96%) provided five or more days of data, but five people filled in four or less days, therefore they were excluded from the analyses reported here. This high drop-out rate is probably due to the fact that it was the start of the academic year and most of the participants were new to university; thus, they were likely to be busy either socialising or studying in the evenings. Of the 125 included participants, 98 (78%) were female and the mean age was 19.52 (SD = 1.92) with a range of 18 to 34.

### **Design**

A between-subjects design was used. Demographics (sex and age), psychosocial variables (optimism, pessimism, social support) and daily variables (hassles and uplifts, current mood) were used to predict later URTI symptoms whilst controlling for negative affectivity.

### **Psychosocial Measures**

Optimism and Pessimism were evaluated using the Life Orientation Test (LOT; Scheier and Carver 1985). Respondents rate how much they agree with eight statements (four positive and four negative to assess optimism and pessimism respectively) on a 5-point scale (from 0 = 'strongly agree' to 4 = 'strongly disagree'). The test has high construct validity, test-retest reliability ( $r = .79$  over four weeks) and internal reliability ( $\alpha = .76$ ) (Scheier and Carver 1985). In the present study, both subscales had good internal reliability ( $\alpha = .76$  for optimism, and  $.79$  for pessimism).

Social support was measured with the short form of the Social Support Questionnaire (SSQ6; Sarason et al. 1987) which assesses network size and satisfaction with this network. Participants list initials of people they can count on for support in six situations; the mean number of initials listed provides the network score. For each situation respondents also rate how satisfied they are with their support on a 6-point scale (from 1 = 'very dissatisfied' to 6 = 'very satisfied'), and a mean satisfaction score is calculated. Both dimensions have good internal reliability ( $\alpha$  ranging from  $.90$  to  $.93$ ; Sarason et al. 1987).

Negative affectivity was assessed using the trait section of the State and Trait Anxiety Inventory (STAI; Spielberger 1983). Respondents rate how frequently they agree with each of 20 statements (e.g., 'I feel nervous and restless') on a 4-point scale (from 1 = 'almost never' to 4 = 'almost always'). The measure has excellent internal reliability ( $\alpha = .93$ ; Spielberger 1983).

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### Daily Measures

URTI symptoms were assessed with the URTI subscale of the Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker 1982). This subscale includes 35 of the 54 original symptoms (e.g., sneezing spells; running nose) (Lyons and Chamberlain 1994). Respondents rate their experience of each symptom on a 5-point severity scale (from 0 = 'not at all' to 4 = 'extreme'). The measure displays high internal reliability ( $\alpha = .86$ ; Lyons and Chamberlain 1994).

Hassles and uplifts were measured using the interpersonal subscale of the student version of the hassles and uplifts scale (Lyons and Chamberlain 1994; adapted from DeLongis et al. 1988), which consists of 13 items (e.g., 'Your lecturers or tutors' in place of 'Your supervisor or employer'). Respondents rate how much of a hassle *and* an uplift each item was that day on two 4-point scales (both from 0 = 'none' to 3 = 'a great deal').

Mood was measured using the composed-anxious section of the Profile Of Mood States bi-polar form (POMS-BI; Lorr and McNair 1982). Respondents rate how much their feelings are like each of 12 adjectives on a 4-point scale (from 0 = 'much like' to 3 = 'much unlike'). Six adjectives are negative (e.g., uneasy) and six are positive (e.g., serene), providing both and 'anxious' and 'composed' scores. These subscales were both internally reliable ( $\alpha$  ranging from .87 to .89 for anxiety, and .85 to .90 for composure across the days of the week).

## RESULTS

Table 1 displays the means and standard deviations of the psychosocial variables and the daily variables on Day 1 (Friday), as well as their inter-relations. The psychosocial variables were related as expected, with negative affectivity having a positive relationship with pessimism, and negative relationships with optimism and both aspects of social support. Negative affectivity also correlated positively with Day 1 URTI symptoms, interpersonal hassles, and anxious mood, and had a moderate negative relationship with composed mood. Negative affectivity also correlated with URTI symptoms on 5 of the other 6 days ( $r$ s ranged from .19 to .25,  $p$ s < .05), and as it is assumed to be an indicator of reporting bias, it was controlled for in all subsequent analyses.

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**Table 1.** Descriptive Statistics and Correlations Among Psychosocial Variables (Trait Anxiety, Optimism, Pessimism, Social Support) and Daily Variables (Symptoms, Mood and Interpersonal Events on Day 1).

	Psychosocial Variables					Daily Variables: Day 1				Descriptives
	Negative Affectivity	Optimism	Pessimism	Support Satis.	Support Network	URTI Symp.	Interpers. Hassles	Interpers. Uplifts	Anxious Mood	Mean (SD)
<b>Psychosocial Vars</b>										
<b>Negative Affectivity</b>										42.70 (9.64)
<b>Optimism</b>	-.65***									9.01 (3.19)
<b>Pessimism</b>	.63***	-.65***								5.83 (2.88)
<b>Support Satisfaction</b>	-.19*	-.09	.05							5.12 (0.98)
<b>Support Network</b>	-.34***	.16	-.14	.18*						4.93 (2.07)
<b>Daily Var: Day 1</b>										
<b>URTI Symptoms</b>	.18*	-.04*	.09	.01	-.13					12.72 (12.11)
<b>Interpers. Hassles</b>	.26**	-.08	.05	-.10	-.18*	.28*				3.63 (3.43)
<b>Interpers. Uplifts</b>	-.14	.04	-.09	-.00	.05	.24*	.28**			9.55 (5.08)
<b>Anxious Mood</b>	.47***	-.20*	.30**	.09	-.05	.19*	.32***	-.05		4.38 (4.20)
<b>Composite Mood</b>	-.34***	.19*	-.27**	.11	.07	-.16	-.13	.07	-.59** *	9.21 (4.20)

\* p < .05; \*\* p < .01; \*\*\* p < .001

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On Day 1, URTI symptom reports were positively related to both hassles and uplifts, as well as anxious mood. Whilst anxious mood correlated weakly with hassles, it was not related to uplifts. Composed mood did not correlate with any daily variable except anxious mood, which it related negatively to.

The relationships of age and sex with other variables were also examined. Older individuals reported higher negative affectivity ( $r = .18, p < .05$ ) and women reported larger social support networks than men did ( $t(121) = -2.39, p < .05$ ). Neither age nor sex were related to URTI symptom reports on any day, whilst age was associated with composed mood, but only on Day 6 (Wednesday;  $r = -.22, p < .05$ ). Age was inconsistently related to hassles and uplifts ( $r$ s ranged from  $-.15$  to  $.22$ ), whereas women tended to report more hassles and uplifts (although not consistently across all days;  $t$ s ranged from  $-3.87$  to  $.09$ ,  $p$ s ranged from  $< .001$  to *n.s.*). Therefore, both age and sex were also controlled for in subsequent analyses.

### **Do Interpersonal Hassles or Uplifts Vary Between Weekdays and the Weekend?**

To examine whether minor events differed between weekdays and the weekend, within-subject comparisons were undertaken. These analyses revealed that significantly more interpersonal uplifts were reported on the weekend (i.e. Days 2 and 3) than during the week (i.e. Days 1 and 4 to 7) (means 8.95 and 7.98 respectively;  $t(123) = 3.38, p < .001$ ), but no difference existed for interpersonal hassles ( $t(123) = .33, n.s.$ ). To examine the effects of this variation in events that existed across the weekdays and weekend, difference scores between the means for both hassles on the weekend and weekdays and uplifts on the weekend and weekdays were calculated and the effects of entering these as control factors in later analyses were investigated.

### **Are Interpersonal Hassles or Uplifts Related to URTI Symptoms Two to Four Days Later?**

To examine the effects of hassles and uplifts on URTI symptoms later in the week, three series of hierarchical multiple regressions were undertaken. The first series examined two-day lags (e.g., Day 1 events on Day 3 URTI symptoms, Day 2 events on Day 4 URTI symptoms, etc.), the second series examined three-day lags, while the third series examined four-day lags. In all analyses age, sex and negative affectivity were entered in the first step of the hierarchical regressions. Interpersonal hassles and uplifts from the relevant day were entered on the second step. Due to the number of tests undertaken in these and subsequent regression analyses,  $\alpha$  was set to the more stringent level of  $< .01$ .

As shown in Table 2, minor events explained a significant increase in the variance of URTI symptoms two days later in three of the five analyses. These events predicted symptoms three days later in three out of four analyses, and predicted symptoms four days later in one out of three analyses. The amount of variance explained in URTI symptoms ranged from 7 to 10%, and these effects were due to interpersonal hassles rather than uplifts. These regressions were re-run including the weekend-weekday variation scores in events as control factors. Statistically controlling for event variation in this way did not change the overall pattern of findings; some of the  $R^2$ -change and  $\beta$  values presented in Table 2 were minimally altered. (This procedure was repeated in all other analyses, but as no notable effects were discovered, no further results on this procedure are reported.)

**Table 2.** Two to Four Day Lagged Relationships Between Previous Interpersonal Events and URTI Symptoms (Controlling for Age, Sex, and Negative Affectivity).

The Effects of Events Two Days Previous										
	Day 1 - Day 3		Day 2 - Day 4		Day 3 - 5		Day 4 - 6		Day 5 - 7	
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β
Hassles	.05	.23	.03	.15	.09**	.26**	.07**	.24**	.07**	.26**
Uplifts		.01		.11		.16		.12		.06
The Effects of Events Three Days Previous										
	Day 1 - Day 4		Day 2 - Day 5		Day 3 - Day 6		Day 4 - Day 7			
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β		
Hassles	.07**	.24**	.05	.19	.07**	.14	.10***	.27**		
Uplifts		.08		.13		.22		.18		
The Effects of Events Four Days Previous										
	Day 1 - Day 5		Day 2 - Day 6		Day 3 - Day 7					
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β				
Hassles	.10 **	.25**	.00	.00	.06	.19				
Uplifts		.15		.00		.15				

\*\* p < .01; \*\*\* p < .001

To check whether these effects existed only for two- to four-day lags, a set of comparative analyses of other lags were carried out. No effects reached significance for any of the five- or six-day lags. However, in three out of six analyses, minor events predicted URTI symptoms the following day; this occurred for the influence of Day 4, 5, and 6 minor events on Day 5, 6, and 7 URTI symptoms ( $R^2$ -changed = .12, .07, .10;  $p < .001, .01, .01$ , respectively). Again, the effect was solely due to hassles ( $\beta$  s = .33, .27, .31;  $p < .001, .01, .001$ , respectively).



## **Do Interpersonal Hassles or Uplifts Interact with Psychosocial Variables to Affect Later URTI Symptoms?**

To examine whether optimism, pessimism, or social support interacted with hassles and uplifts to affect URTI symptoms two to four days later, another four series of hierarchical regressions were employed. As before, age, sex, and negative affectivity were entered on the first step. The main effects of interpersonal hassles and uplifts on the relevant baseline day were entered on the second step, and the main effects of optimism, pessimism, network size, and support satisfaction were entered on the third step. On the final step the standardised deviation score product terms of interpersonal hassles with each psychosocial variable, and interpersonal uplifts with each psychosocial variable, were entered. In this way the joint effects of two variables measured on different scales can be seen (i.e. without the scale with the larger range having an exaggerated influence; see Finney et al. 1984).

Results of these 12 regression analyses demonstrated that none of the psychosocial factors were having significant main effects above those of events and the control factors ( $\beta$  s ranged from  $-.21$  to  $-.01$ , n.s.). The interaction terms significantly increased the variance explained in URTI symptoms once for a two-day lag (Day 4  $\rightarrow$  Day 6;  $R^2$ -change =  $.16$ ,  $p < .001$ ) and once for a four-day lag (Day 1  $\rightarrow$  Day 5;  $R^2$ -change =  $.16$ ,  $p < .01$ ), and approached significance for a further two two-day lags (Day 1  $\rightarrow$  Day 3;  $R^2$ -change =  $.14$ ,  $p < .05$ ; Day 3  $\rightarrow$  Day 5;  $R^2$ -change =  $.13$ ,  $p < .05$ ), and two three-day lags (Day 1  $\rightarrow$  Day 4;  $R^2$ -change =  $.13$ ,  $p < .05$ ; Day 3  $\rightarrow$  Day 6;  $R^2$ -change =  $.12$ ,  $p < .05$ ). These were all due to one interaction product term, namely the joint effects of interpersonal hassles and support network ( $\beta$  s =  $-.36$ ,  $-.34$ ,  $p$  s  $< .001$ ; and  $-.29$ ,  $-.31$ ,  $-.29$ ,  $-.30$ ,  $p$  s  $< .01$ ), with one exception. The two-day Day 4  $\rightarrow$  Day 6 lag was also due to joint effects of hassles and optimism ( $\beta = -.45$ ,  $p < .001$ ), however this effect was found only once, and therefore was not investigated further.

To examine the hassles-support network interaction effect further, interpersonal hassles on Day 1 and support network scores were split at the median, and the cell means of URTI symptoms on Day 5 were calculated and examined. Interpersonal hassles had very little impact on later URTI symptoms among people with a large support network, but for those reporting a small support network, experiencing hassles was positively associated with later URTI symptoms. Cell means for the effects of interpersonal hassles and support network on URTI symptoms for the other lags were also examined, and all showed an identical pattern.

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As minor events were also found to predict next-day URTI symptoms, six further analyses were undertaken to examine interaction effects with one-day lags. Results showed that hassles and social support network combined to affect next-day URTI symptoms on two occasions (Day 2  $\rightarrow$  Day 3;  $\beta = -.35$ ,  $p < .001$ ; and Day 4  $\rightarrow$  Day 5;  $\beta = -.30$ ,  $p < .01$ ).

## **Does Anxious or Composed Mood Mediate the Effect of Interpersonal Hassles and Uplifts on Later URTI Symptoms?**

Following the Baron and Kenny (1986) model of mediation, we examined the possible mediating role of mood on the relationship between interpersonal events and URTI symptoms in the

following way: Firstly, we examined whether minor events predicted later URTI symptoms (as shown in Table 2, events did predict symptoms one to four days later). Secondly, to examine the initial stage of the mediation relationship (whether events predicted mood), we regressed same-day mood on interpersonal events. Two series of regression analyses were carried out across the week, one for each valence of mood. As shown in Table 3, the results highlighted that this initial stage of mediation was apparent. Minor events had a significant impact on anxious mood on Days 2, 4, 5, and 6 (effects which were primarily due to interpersonal hassles), and also a significant impact on composed mood on Days 2 to 7 (effects which were due to both hassles and uplifts). As expected, hassles were positively associated with anxious mood and negatively with composed mood, while the opposite pattern was observed for uplifts.

Thirdly, to examine the second stage of the mediation relationship (whether mood predicted later symptoms), we regressed the relevant day symptom scores on composed and anxious mood on the base days. Thus, for each lagged analysis, age, sex, and negative affectivity were entered on the first step, and anxious and composed mood on the second step. There was little evidence for this second stage of mediation, as shown in Table 4. In only one of the twelve lagged analyses did anxiety and composure significantly predict later symptoms (Day 3 → Day 5).

Finally, to check whether entering mood in the regression equation accounted for the relationship between minor events and later URTI symptoms, we carried out the same series of regression analyses as previously, with hassles and uplifts entered on the final step. Any reduction in the amount of variance accounted for by events (seen in regressions without mood, as shown in Table 2) provides evidence of partial mediation. Table 4 displays the R<sup>2</sup>-change statistics and β values for the effects of interpersonal hassles and uplifts on URTI symptoms two to four days later, while controlling for same-day mood. These results show that the variance explained in URTI symptoms by minor events is reduced by only 1 or 2% when mood is statistically controlled, providing little evidence for a mediating effect of mood. (Similar findings were obtained when one-day lags were examined).

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**Table 3.** The Same-Day Effects of Interpersonal Events on Anxious and Composed Mood (Controlling for Age, Sex, and Negative Affectivity).

Anxious Mood														
	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β	R <sup>2</sup> - Chan- ge	β
<b>Hassl es</b>	.04	.2 2	.09**	.32* **	.06	.21	.17** *	.33* **	.15** *	.41* **	.13** *	.29* **	.03	.12
<b>Uplif t</b>		- .0 6		-.01		-.15		- .31* **		-.11		- .24* *		-.12

Composed Mood														
Hassles	.00	-.05	.07**	-.25*	.06	-.05	.11**	-.26*	.09**	-.31**	.14**	-.24*	.07**	-.08
Uplift		.04		.16		.25**		.26*		.13		.32**		.27**

\*\* p < .01; \*\*\* p < .001

**Table 4.** Mediation Influence of Same-Day Mood on the Two to Four Day Lagged Relationships Between Previous Interpersonal Events and URTI Symptoms (Controlling for Age, Sex, and Negative Affectivity).

The Effects of Mood and Events Two Days Previous										
	Day 1 - Day 3		Day 2 - Day 4		Day 3 - Day 5		Day 4 - Day 6		Day 5 - Day 7	
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β
Anxiety	.01	.14	.00	.07	.08**	.35**	.03	.20	.05	.15
Composure		.09		.08		.12		.01		.12
Hassles	.04	.22	.03	.17	.07**	.21	.06	.15	.06	.21
Uplifts		.02		.10		.18		.19		.12
The Effects of Mood and Events Three Days Previous										
	Day 1 - Day 4		Day 2 - Day 5		Day 3 - Day 6		Day 4 - Day 7			
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β		
Anxiety	.00	.08	.01	.15	.07	.33**	.02	.15		
Composure		.03		.09		.24		-.02		
Hassles	.07	.24	.05	.20	.05	.09	.09**	.19		
Uplifts		.07		.12		.22		.24		
The Effects of Mood and Events Four Days Previous										
	Day 1 - Day 5		Day 2 - Day 6		Day 3 - Day 7					
	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β	R <sup>2</sup> - Change	β				
Anxiety	.01	.13	.01	.12	.03	.20				

<b>Composure</b>		.10		.09		.01	
<b>Hassles</b>	.09**	.24	.00	-.03	.05	.15	
<b>Uplifts</b>		.14		-.01		.17	

\*\* p < .01; \*\*\* p < .001

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## DISCUSSION

The aim of the present study was to replicate previous findings of a lagged relationship between minor events and URTI symptoms. In the present sample interpersonal hassles affected URTI symptom reports one to four days later, whilst uplifts had no significant lagged effects. These minor events did not predict URTI symptoms five to six days later. We also hypothesised that certain psychosocial resources would interact with minor events to affect URTI symptoms. Optimism, pessimism, and social support satisfaction did not interact with events to predict later URTI symptoms. However, support network and interpersonal hassles combined to affect URTI symptoms one to four days later. We further predicted that anxious and composed mood may mediate the stress-URT I relationship, and although this was not fully supported, interpersonal events clearly affected same-day mood.

The lagged relationship found between interpersonal events and URTI symptoms in the present study is consistent with previous research (Evans and Edgerton 1991; Sheffield et al. 1996). This relationship held for lags of one to four days, but nothing beyond four days. Previous daily research has not found lags as short as one day, but according to Tyrell et al. (1993) this is in-line with the onset of some URTI symptoms: their experimental work showed that URTI symptoms peak around three or four days after infection, although different patterns existed for various URTI symptoms, depending on the viral agent given. Stone et al. (1994) have reported one- to two-day lagged effects of uplifts on secretory immunoglobulin A antibody (this relationship did not occur for hassles), although they did not examine how this lag goes on to affect symptom reporting.

Unexpectedly, the effects observed in the present study were only due to hassles, not both hassles and uplifts as predicted. Previous findings regarding the differential effects of hassles and uplifts have been mixed, with some studies showing effects for both hassles and uplifts (Stone et al. 1987), and others demonstrating effects for uplifts only (e.g., Evans and Edgerton 1991; Evans et al. 1988). Perhaps these differences arise from different study designs, such as between- versus within-subject, the type of minor events considered, and the time-frame of participant recall. It is also possible that experiencing interpersonal hassles is more important for later symptoms than experiencing interpersonal uplifts. Experiencing such hassles may influence the tendency for people to over-report physical symptoms, or may actually influence how much attention people pay to themselves and their bodily sensations.

A greater number of interpersonal uplifts were reported on the weekend days than during the week, whereas no difference existed for hassles. This result indicates that the aversive effect of hassles on later symptoms would exist across all types of days, and maybe the influence of a dip in uplifts would be most detrimental at the weekend. Controlling for this variation in events did not remove the lagged effects of hassles observed in the present study, but questions of the influence of day the week and interruption to routine could be addressed in longer, more detailed diary studies.

The effects of interpersonal hassles on URTI symptoms one to four days later was moderated by support network size. Interpersonal hassles were positively related to URTI symptoms among people with a small network, whereas little or no relationship existed among people with a large network. This buffering effect has also been found in studies of life-event stress and URTIs (Turner Cobb and Steptoe 1996, 1998), as well as undesirable minor events and next-day mood (Affleck et al. 1994), although the present study is the first to report results with interpersonal events on their own. Interpersonal hassles may have less impact for individuals who have a large network because these people may be exposed to more positive interpersonal interaction in which events are positively reinterpreted. However, in the present study no relationship existed between support network size and interpersonal uplifts. Perhaps those with smaller networks do not have as many close contacts to provide support when they experience hassles, thus leading them to engage in more unhealthy behaviours. Future diary studies could examine daily levels of social interaction and health behaviours to investigate whether people with a large network actually make use of this support in reaction to stress, and if such contact on a daily basis is related to health behaviours and URTI symptoms.

As in previous research, optimism and pessimism appeared to be relatively independent of each other. Both optimism and pessimism were related to negative affectivity, contrary to a previous study in which negative affectivity was related only to pessimism (Marshall et al. 1992). However, no consistently significant interactive or main effects of either optimism or pessimism were found on URTI symptoms, contrary to previous research (e.g., Lyons and Chamberlain 1994, 1998). Optimism is usually conceptualised in terms of generalised outcome expectancy, such that people who expect positive outcomes are termed optimists, and those expecting negative outcomes, pessimists. However, researchers have argued that the domain and level of generality is important in expectancy theory (Peterson 2000). Therefore, rather than employing a generalised optimism measure, it may be useful to consider expectancies specific to the type of events under investigation. In the present study, participants' expectancies concerning their daily interpersonal interactions may have been more important than their overall dispositional optimistic/pessimistic outlook. Further, whilst the present study examined particular psychosocial resources in the context of interpersonal stress and symptom experience, future research may benefit from examining other types of psychosocial resources in the context of other types of minor events. For example, functional/tangible social support may be particularly relevant to the effects of work and/or financial hassles and uplifts.

It was predicted that anxious or composed mood may mediate the stress-URTI relationship. Between-subjects analyses showed that interpersonal hassles and uplifts both predicted anxious and composed mood across the week. However, no consistent significant relationship was found between mood and later URTI symptoms, discounting a full mediational pathway. When mood was statistically controlled for, there was a small reduction in amount of variance in URTI symptoms explained by minor events, indicating minor, partial mediation. This is consistent with previous findings for events, mood, and immunity (e.g., Stone et al. 1996). However, mood states other than anxiety and composure, such as depression and elation, may provide stronger mediation.

An alternative explanation of the lack of full mediation by mood in the present study is that the effect of daily stress on URTI symptoms may be independent of any affective component (cf. Evans et al. 1996). For example, Smith et al. (1992) found that previous poor mood did not increase susceptibility to subsequent URTI. Therefore, it may be beneficial to investigate potential mediators of the stress-URTI relationship other than mood, such as specific behaviours. Refraining from smoking cigarettes, and consuming moderate amounts of alcohol, have both been related to reduced URTI incidence (Cohen et al. 1993; Turner Cobb and Steptoe 1996).

As well as fluctuating daily, mood is believed to vary within the day. Thayer (1996) reports that anxiety peaks in the late afternoon and early evening, which could have caused a potential confound. No assessment of compliance with the time of completion of the diary was carried out in the present study, and incorrect completion time could affect results due to within-day fluctuations in anxiety.

There are several other limitations of the present study. The seven-day period of data collection was relatively short, and a longer period may have captured more URTI episodes. Nevertheless, over this short recording period, some people who originally agreed to participate dropped out, and this may have been more likely amongst those who were ill or experiencing more events than usual. It is possible that there are day of the week effects; for example hassles experienced on the weekend may have a greater impact on physical health than hassles on other days. However, the present seven-day study was too short to address this issue, but it raises possibilities for future research. Furthermore, the present sample consisted of young, healthy students, limiting generalisability, and also contained a high proportion of females who have been shown to report higher interpersonal stress (Davis, Matthews and Twalmley 1999). However, analyses did not show consistent differences between males and females in events or mood.

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A further limitation is that only subjective symptom reports were employed in the present study, and these were not objectively verified. Subjective URTI symptom reporting has been related to objective health measures in previous research (e.g., mucus weight; Cohen et al. 1995), although other studies show that people report such symptoms in the absence of a verifiable URTI (Feldman et al. 1999). However, regardless of verifiable illness, the symptoms an individual perceives themselves as experiencing are an important focus for research in this area. Perceived symptom level is one of the strongest predictors of illness behaviour, determining whether the

sick-role is taken on, whether health care resources are utilised, and whether days are taken off work due to illness (Gijsbers van Wijk, Huisman and Kolk 1999). Therefore, we believe subjective symptom reporting is a pertinent focus for the investigatory study of the influence of daily and psychosocial processes.

The importance of URTIs is well known: they often lead to lower respiratory tract infections (LRTIs) which are known to be caused by the same viruses (Halperin et al. 1983). These infections are potentially life threatening for high risk groups including the elderly, infants, and people suffering from immunosuppressive diseases such as AIDS. Further, URTIs have serious economic effects, and hence social effects, due to considerable periods of unproductivity (Keech, Scott and Ryan 1997). The present study found that interpersonal hassles affected URTI symptom reports over the following four days, and that this effect was buffered by social support network, highlighting the importance of simultaneously considering psychosocial factors, minor events, and daily processes on health.

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