Physical health, positive and negative affect, and personality: A longitudinal analysis

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A B S T R A C T

This study used structural equation modeling to examine longitudinal relations among physical health, personality and mood in a sample of 360 college students. Research focused on the longitudinal associations among physical health and mood and their systematic relations with the Big Five personality dimensions of Extraversion and Neuroticism. Longitudinal analyses over successive 1-month intervals revealed lagged reciprocal effects between physical health and negative affect. After controlling for the effect of negative affect, physical health influenced subsequent positive affect, but positive affect did not influence subsequent physical health. Implications of these findings for subsequent research on health, personality, and emotions are discussed.

1. Introduction

In a great deal of research, scholars have tried to better understand the relationship between affect, personality and physical health. Negative affect (NA) is associated with a number of physical and mental health outcomes (Chida & Hamer, 2008; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Kubzansky & Kawachi, 2000), and has been of interest to scholars for quite some time. More recently, scholars have also started to examine the role of positive affect (PA), with some initial studies suggesting that PA may also be an important factor for understanding physical and mental health (Pressman & Cohen, 2005).

Associations between NA, PA and self-reported physical health have been demonstrated in the literature, but the vast majority of these studies have used cross-sectional designs (Lyubomirsky, King, & Diener, 2005; Suls & Bunde, 2005). As such, important conceptual questions remain unanswered. First, the causal direction underlying the association between affect and physical health has yet to be resolved. Second, many studies examining the effect of affect on health fail to compare the effects of PA and NA simultaneously, which leaves questions regarding which construct explains most of the variance in physical health. Third, Neuroticism has well-documented links to self-reported health (Watson & Pennebaker, 1989), but it is plausible that another major dimension of personality, such as Extraversion contributes to self-reported physical health above and beyond NA and PA. In the current paper, we develop and empirically test a longitudinal model that addresses these gaps in the literature by systematically examining the links between PA, NA, personality and physical health.

1.1. Positive affect, negative affect and physical health

PA and NA represent the broadest conceptualization of overall mood (Watson, Clark, & Tellegen, 1988). PA reflects an individual’s level of pleasurable engagement with the environment, and is characterized by feelings of enthusiasm, high energy, and attentiveness. NA reflects an individual’s experience of distress, dissatisfaction, or unpleasant arousal, and is characterized by guilt, fear, anger, and nervousness. PA and NA represent individuals’ levels of approach or withdrawal, and as such can be conceptualized as positive activation (PA) and negative activation (NA) (Watson, Tellegen, Vaidya, & Vail, 1990).

In a series of seven studies examining the relation between affect and physical symptom reporting, Watson and Pennebaker (1989) found a consistent association between both state and trait NA and somatic health complaints. Similarly, using a longitudinal design in which common physical symptoms (e.g., respiratory problems) and affect were measured daily, Brown and Moskowitz (1997) found unpleasant affect related to concurrent as well as subsequent common physical symptoms. Finally, Knapp et al. (1992) used a laboratory procedure and found that the experience of NA resulted in increases in systolic blood pressure and decreases in mitogenic lymphocyte reactivity. Qualitative and meta-analytic reviews of NA and health bolster these earlier findings, showing that NA is related to cardiovascular disease (Kubzansky & Kawachi, 2000; Suls & Bunde, 2005), decreased immune functioning,
(Kiecolt-Glaser et al., 2002), and physiological responses to stress (Chida & Hamer, 2008).

In contrast to the consistent relationship between NA and physical health, measures of PA exhibit weaker and inconsistent associations with physical symptom reporting (Cohen & Pressman, 2006). On one hand, meta-analytic research suggests that positive affect relates to physical health and immunity at $r = .38$ (Lyubomirsky et al., 2005). On the other hand, across three different samples, Watson and Pennebaker (1989) obtained a mean correlation of only $-.15$ between trait PA and common physical symptoms. Similarly, Watson and Clark (1992) found somatic complaints to correlate between $-.15$ and $-.21$ with general PA. By comparison, correlations between common physical symptoms and NA were much stronger and ranged from $.24$ to $.46$.

A limitation of these studies and most of the studies examining PA, NA, and physical health is that researchers often look at just PA or NA, not both simultaneously. This is problematic, as PA and NA tend to be negatively correlated. There are some exceptions, however. In a cross-sectional study that explicitly examined the comparative utility of PA and NA in predicting physical health, Dua (1993) found NA, but not PA, to significantly predict physical health. In a second study, however, Dua (1994) found both dimensions of affect to predict physical health significantly, but NA proved to be the better predictor in terms of proportion of explained variation in the criterion. Following this trend, NA, but not PA, is associated with chronic stress (Steptoe, O’Donnell, Marmot, & Wardle, 2008). In the area of immunology, researchers have found that negative psychological states tend to be stronger predictors than positive psychological states (Cohen & Herbert, 1996). These findings support the overall notion that “bad is stronger than good” (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

In a comprehensive review of the literature, Pressman and Cohen (2005) suggested reasons why PA relates to health less consistently than NA. First, there is less agreement among researchers regarding the nature of PA. Researchers debate if PA was related to health because PA was the absence of NA or because it is a substantively different emotional state (Keyes, 2003). Second, there are inconsistencies in the literature regarding the conceptualization and operationalization of PA. For example, the Levy, Slade, Kunkel, and Kasl (2002) study is often cited as strong evidence for the relationship between PA and health, but PA was not actually measured. Satisfaction with Aging was used. Similarly, reports of subjective well-being, satisfaction with life, and positive psychological traits, such as optimism, are often used interchangeably with PA. Furthermore, there may be heterogeneities in mechanisms across samples, supported by findings that PA may be related to health among older individuals, but that PA may actually be harmful to institutionalized individuals and individuals coping with a serious illness (Pressman & Cohen, 2005).

Although the empirical link between NA and physical health is clear, there is no current consensus among researchers regarding the mechanisms that might explain the association. One explanation, the psychosomatic hypothesis (Watson & Pennebaker, 1989), suggests that chronically elevated levels of NA trigger a variety of health problems through multiple pathways, including cortisol profiles, inflammatory processes, and sleep disturbances (Steptoe, Dockray, & Wardle, 2009), which in turn are manifested as higher scores on physical symptom measures. A second plausible interpretation, however, is that causality operates in the reverse direction with physical health problems resulting in higher levels of subsequent NA, called the disability hypothesis (Watson & Pennebaker, 1989). The underlying logic of this model is that health problems tend to generate substantial stress and physical discomfort, which result in elevated levels of psychological distress and NA. Researchers have also proposed mechanisms by which PA leads to improved physical health. Pressman and Cohen (2005) propose that PA may directly lead to improved health through improved health practices, social ties, endogenous opioids, and hypothalamic–pituitary–adrenal axis activation or may indirectly lead to improved health by serving as a stress buffer and helping individuals to cultivate important social, psychological, and physical resources (Fredrickson, 1998). Alternatively, individuals who are not in good health may not report the energy that characterizes PA.

1.2. Positive affect, negative affect, and personality

Personality is one of the most robust predictors of PA and NA (DeNeve & Cooper, 1998; Diener & Lucas, 1999). In earlier research, Costa and McCrae (1980) noted that NA correlates significantly with characteristics associated with Neuroticism, and PA correlates with characteristics associated with Extraversion. Moreover, NA is largely unrelated to Extraversion, and PA is generally unrelated to Neuroticism (e.g., Larsen & Ketelaar, 1991). Tellegen (1985) argued that Extraversion and Neuroticism reflect basic dimensions of emotional temperament that relate to an inherent susceptibility to positive and negative emotional experiences (cf., Rothbart, 1991). In this view, traits related to Extraversion foster a predisposition towards the experience of positive mood, whereas traits related to Neuroticism relate to a susceptibility to negative mood experiences. For example, Lucas, Le, and Dyrenforth (2008) found a relationship between extraversion and PA, even after controlling for social activities. Indeed, meta-analytic investigations show that Extraversion relates to PA at $.44$ and Neuroticism relates to NA at $.54$ (Steel, Schmidt, & Shultz, 2008), and there is support for NA mediating the relationship between Neuroticism and related outcomes and for PA mediating the relationship between Extraversion and related outcomes (Rusting, 1998).

The present investigation used a longitudinal design to empirically investigate the directionality of self-reported physical health and affect. In contrast to cross-sectional analyses based on ordinary least-squares regression, estimation of a longitudinal model permitted the assessment of hypothesized reciprocal relations between personality, affect and physical health complaints across time, as well as a comparison of the relative strength of the lagged effects in each direction (Dwyer, 1983). We measured personality at time one, and measured NA, PA, and physical health complaints at times one, two, and three.

2. Method

2.1. Participants and procedure

A total of 360 undergraduate students enrolled in two sections of an introductory psychology course participated in return for extra course credit. Three consecutive assessments were separated by a period of 30 days. The first measurement occurred during the beginning of the semester, the second during midterms, and the third during finals week. We chose times during the semester when students would be coping with a number of stressors, which we thought would help increase the variability in physical health reports. To justify completion of the same measures, participants were told that they were involved in a study of stability and change in physical health and mood. Sixty-nine percent of the sample was female. The majority of participants was 18 or 19 years old (75.4%) and White, non-Hispanic (81.3%). The modal reported family income was above $60,000 (44.3%), with another 20.1% reporting their family income between $45,000–$60,000.
2.2. Measures

2.2.1. Physical health

The 20-item short-form of the General Health Survey (SF-20; Stewart, Hays, & Ware, 1988) was used to measure self reports of physical health in the present study. We examined physical functioning, role functioning, and health perceptions. Respondents rated aspects of their physical health using a 5-point Likert scale with higher scores on physical functioning and health perceptions reflecting better functioning and lower scores on role functioning reflecting better functioning. Coefficients alpha for the physical functioning subscale (four items), the role functioning subscale (four items), and the health perceptions subscale (three items) were .80, .83, and .86, respectively.

2.2.2. Positive and negative affect

The Positive and Negative Affect Scale (PANAS; Watson et al., 1988) was used to measure PA and NA. Each scale consists of 10 items that represent aspects of either high PA or high NA. Characteristics assessing NA include “scared,” “ashamed” and “jittery” whereas descriptors assessing positive affect include “enthusiastic,” “excited,” and “happy.” Respondents indicated on a 5-point scale the extent to which they had experienced each mood state during the previous one-week period. Coefficients alpha were .93 and .88 for PA and NA, respectively.

2.2.3. Neuroticism and extraversion

Two subscales from the 44-item version of the Big Five Inventory (BFI-V44; John, Donahue, & Kentle, 1991) were used to measure Neuroticism and Extraversion. For each item, subjects were asked to rate, on a 5-point scale, the degree to which the personality attribute applied to them. In the present study, the Neuroticism and Extraversion scales demonstrated moderate internal consistency, as shown by coefficients alpha of .77 and .86, respectively.

3. Results

3.1. Model selection

To investigate the relationships between physical health and affect, we sought a longitudinal model that would capture two key features of the data. First, we wished to use a model that permitted tests of the lagged relationships of both the affect → health relationship and the health → affect relationship so that causal precedence could be assessed. Not all longitudinal models permit such tests, as we discuss below. Second, the substantial rank order stability of personality and related variables has been well documented in meta-analytic studies (Conley, 1984; Roberts & DelVecchio, 2000). Roberts and DelVecchio found that the mean rank order stability is .54 during the college years, with both extraversion (.54) and neuroticism (.50) falling close to this mean value. Based on fitting curves to the results of very long term studies, Conley (1984) suggested that the decrease in the stability as the time interval between measurements increased was proportional to $s^n$ where $s$ is the annual stability and $n$ is the number of years. Cole (2012) reported a similar negative exponential decrease to a lower asymptote in test–retest correlations of personality, temperament, and depression as the number of months between measurements increased. These findings are consistent with a model that has an autoregressive (lag 1) process (West & Hepworth, 1991). They also imply that the rank order stability would be expected to be very high in the present data set given the 1 month time interval between measurement waves.

One model that captures both of these features is the cross-lagged panel model (see Biesanz, 2012; Kessler & Greenberg, 1981). In this model, lagged bidirectional relationships can be examined, giving rise to the possibility of establishing causal precedence. The effect of X (e.g., physical health) on Y (e.g., negative affect; positive affect) 1 month later can be estimated controlling for the value of Y observed 1 month previously. Similarly, the effect of Y on X 1 month later can be estimated controlling for the value of X observed 1 month previously. Stable personality traits measured at the beginning of the study directly influence X and Y at the initial measurement period and exert influences at later time points primarily through the autoregressive processes of the model. Biesanz (2012) notes that such models “offer the ability to estimate and determine causal precedence, a necessary condition for making stronger causal inferences” (p. 467). Cross-lagged panel models can be estimated in either the measured or latent variable framework, with the latter framework having the advantage of providing appropriate correction for measurement error in the measured variables.

A variety of conceptually attractive alternatives to the cross lag panel model are variants of models that partition the measured X and Y variables (or their corresponding latent constructs) into a time-varying state component and orthogonal stable trait component (Eid & Diener, 2004; Steyer, Ferring, & Schmitt, 1992) or into a time varying within-subject component and a stable between-subject component (Ryu, West, & Sousa, 2012). Such partitions have the potential advantage of providing trait and state constructs that map more directly onto some current conceptions of personality. Unfortunately, the basic versions of these models do not easily allow tests of lagged effects nor do they capture the autoregressive nature of the data. In these models the multiple waves of data serve solely as replications. Temporal ordering of the measured variables is not preserved. If the measurement waves were interchanged (e.g., wave 1 was treated as wave 2 and vice versa), identical model fit and parameter estimates would be obtained. The correlation between trait variables (across all waves) or state variables within each wave can be estimated, but such concomitant associations do not address temporal precedence.

To address these issues Kenny and Zautra (1995, 2001) proposed a trait-state-error model for a single construct that includes an autoregressive component. While elegant, the model “is finicky, often failing to converge or generating out-of-range parameter estimates” (Cole, 2012, p. 587). Cole, Martin, and Steiger (2005) showed that this model is theoretically not identified until there are at least four waves of measurement. Even with four waves of data the Kenny and Zautra model produces an unacceptably high rate of problematic solutions unless there are at least 500 participants measured on at least 5 measurement occasions. Problematic solutions are particularly likely when the autoregressive component is relatively high as the model has difficulty distinguishing between the stable trait component and the autoregressive component. Cole (2012) describes several extensions of the Kenny and Zautra model, some of which appear to have improved properties over the original. However, these models appear to require at least four waves of measurement, a relatively large sample size, and their performance has not yet been fully evaluated. Extensions of the Kenny-Zautra model to address the issue of temporal precedence of two constructs (X → Y; Y → X) have not been developed. In the present data set, only three waves of data from $n = 360$ participants were available. The Kenny and Zautra model and Cole’s (2012) extensions are attractive conceptually, but their complexity places stringent demands on the data that we were not able to meet in the present study. Consequently, we used the traditional cross-lagged panel model which has been used to address issues of causal
precedence in past research (Aneshensel, Frerichs, & Huba, 1984; Biesanz, 2012).

3.2. Model specification and estimation

To examine the relations between physical health and affect, the models were estimated using EQS 6 (Bentler, 2006). In specifying the measurement component of the model, scores on three subscales of the SF-20 were used as indicators of the physical health construct. Similarly, for PA and NA, two indicators were used for each construct. These were computed by summing across (a) the first five and (b) the second five PANAS items measuring each affective domain. Finally, two indicators were also employed for each of the exogenous personality dimensions of Neuroticism, Extraversion, and computed by averaging over (a) the first four, and (b) the second four BFI-V44 items measuring each of these three trait dimensions.

In terms of model specification, structural paths reflecting the cross-lagged effects of physical health on NA 1 month later, and NA on physical health 1 month later were specified as free to be estimated. The structural relationships between physical health and PA, by contrast, were constrained to equal zero. To model the effects of personality, paths from Extraversion to PA were specified as free to be estimated, as were the paths from Neuroticism to both NA and physical health. Consistent with domain-specific predictions, the paths from Extraversion to NA and Neuroticism to PA constrained to equal zero. Synchronous relations between constructs were modeled by correlating, within each wave, the structural disturbances associated with physical health and affect (it should be noted that this specification provides no information about directionality of effects). In addition, errors of measurement associated with the same indicator of each construct at successive points in time were correlated.

To perform the strongest test of the longitudinal model (Dwyer, 1983), a number of equality constraints were imposed. First, manifest variable loadings of a given indicator on its target construct at successive points in time were constrained to be equal. Second, autoregressive effects across waves for the same variables were constrained to be equal (e.g., the effect of Time 1 NA on Time 2 NA was constrained to equal the effect of Time 2 NA on Time 3 NA, etc.). Third, covariances between structural disturbances were set equal across waves. Fourth, separate equality constraints were imposed on the lagged effects of (a) NA on health and (b) health and NA (e.g., the effect of Time 1 physical health on Time 2 NA was constrained to equal the effect of Time 2 physical health on Time 3 NA). Finally, equality constraints were imposed on the covariances between the uniquenesses associated with the same indicator of each construct at successive points in time. In addition to providing a stringent test of the hypothesized relations, these constraints also offered the additional benefits of reducing the ratio of subjects to free parameters and forcing invariance (replication) of the effects at each lag.

3.3. Assessment of model fit

Most researchers advocate using multiple fit indices for evaluating model fit (e.g., Hoyle & Panter, 1995; Hu and Bentler, 1999). Currently, the most rigorous evaluation of fit criteria has been conducted by Hu and Bentler (1999). These researchers recommend using a combination of the standardized root mean square residual (SRMR; expected to be .08 or less), the Comparative Fit Index (CFI; Bentler, 1990), which is expected to be .95 or greater, and the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990). Browne and Cudeck (1993) suggest that values of the RMSEA of .05 or less indicate a close fit; values between .05 and .08 indicate adequate fit; values greater than .10 indicate room for improvement in the model. Here we report all three measures (SRMR, CFI, RMSEA). Since these indices do not localize sources of poor fit within a specified model, the normalized residuals and modification indices generated by EQS (Bentler, 2006) were inspected to obtain more detailed diagnostic information. In addition, given the skewness associated with measures of physical health, the Satorra–Ben-
We tested the fit of the model which specified cross-lagged associations between NA and health presented in Fig. 1. The fit was acceptable, as reflected by \( \chi^2 \) (df = 266, N = 360) = 589.08, CFI = .94, RMSEA = .06, SRMR = .08. A chi-square difference test of nested models indicated that the model with cross-lags between physical health and health fit the data significantly better than the simple saturated model (\( \Delta \chi^2 = 3, \Delta \text{df} = 3, N = 360 \) = 22, \( p < .01 \)). The strong domain-specific associations between mood and personality are consistent with the observation that affective components pervade the general personality dispositions of Neuroticism and Extraversion. Finally, Neuroticism exhibited a significant positive direct effect on self-reported physical health (\( \beta = -.42, p < .01 \)).

In terms of coefficients not presented in Fig. 2, autocorrelations among the errors of measurement in the manifest variables were generally moderate in magnitude (approximately .16–.32). At time 1, the correlation between the exogenous constructs of Extraversion and Neuroticism was \( r = - .40 \). Synchronous correlations between the endogenous PA, NA, and health constructs ranged from .29 (health with PA) to -.40 (health with NA), indicating that there may be unobserved concurrent causal influences on affect and health.

Examination of the univariate distributions of the three indicators of physical health revealed these variables to be appreciably right skewed and excessively peaked relative to a normal distribution. Skewness coefficients for these measured health variables ranged from 2.97 to 6.19, while kurtosis ranged from 4.60 to 26.81. Accordingly, robust estimates of the standard errors of the model parameters were employed in the present study to take the observed nonnormality into account (West et al., 1995). Although standard errors generated by normal theory maximum likelihood tend to underestimate sampling variability when nonnormality is present, corrections to normal theory standard errors that circumvent this problem are available. These robust standard errors can be derived from the normal theory covariance matrix and the fourth-order moments of the measured variables. The formula that provides this correction is complex and can be found in Bentler (2006). This correction to the standard errors of the parameter estimates is currently available in EQS and was utilized to obtain robust tests of significance in the present study. However, the use of robust standard errors did not change the obtained pattern of significant associations for any of the longitudinal associations presented in Fig. 2.
3.4. A test of the equality of cross-lagged associations between PA, NA and health

In a second alternative model, a formal test of the equality of cross-lagged relations between physical health and NA was examined. To test this hypothesis, the structural parameters reflecting the effect of health on NA 1 month later and NA on health 1 month later were constrained to be equal. A \( \chi^2 \) difference test indicated that the specification of equal cross-lagged effects failed to significantly degrade the fit of the model (i.e., significantly increase the model chi-square) relative to the model in which these cross-lagged effects were not constrained to equality \( \chi^2 \) change = 0.09, \( df \) change = 1, \( p > .05 \). This result suggested that the effect of NA on subsequent physical health was not significantly larger than the effect of physical health on subsequent NA.

3.5. Tests of equality constraints

Relieving all equality constraints on the autoregressive effects for the variables failed to significantly improve the fit, indicating the plausibility of this constraint \( \chi^2 \) change = 5.41, \( df \) change = 3, \( p > .05 \). Similar nonsignificant decreases in \( \chi^2 \) resulted when the equality constraints were released for the covariance between corresponding structural disturbances \( \chi^2 \) change = 0.51, \( df \) change = 6, \( p > .05 \) and the manifest variable loadings \( \chi^2 \) change = 6.37, \( df \) change = 8, \( p > .05 \), suggesting the reasonableness of both imposed constraints. Finally, releasing the equality constraints for the autocorrelations of the indicator uniquenesses also did not significantly improve in the fit of the model to the data \( \chi^2 \) change = 3.84, \( df \) change = 7, \( p > .05 \). Collectively, these tests supported the tenability of the various constraints that had been imposed during model specification. The consistency of the data with these constraints provides support that the assumptions of the autoregressive cross-lagged model are met (Kenny & Campbell, 1984).

4. Discussion

The results of the present investigation suggest that physical health is differentially related to PA and NA. Self-reported health was reciprocally related to NA across time, but relations between PA and physical health were statistically significant in only one direction, physical health predicting PA, not PA predicting health. Additionally, we included measures of Neuroticism and Extraversion and found that Neuroticism was directly related to physical health. Neuroticism demonstrated indirect effects on self-reported physical health through the mediating variable NA.

Previously, several investigators speculated that relations between physical health and affect were likely reciprocal, but the present study is among the first to demonstrate such influences empirically and longitudinally. Our finding regarding the effect of NA on later symptoms is consistent with the psychosomatic hypothesis proposed by Watson and Pennebaker (1989), which has been supported empirically by others, as well (e.g., Brown & Moskowitz, 1997; Krantz & McCeney, 2002). The observed effect of health perceptions on subsequent NA, by contrast, provides empirical support for the disability hypothesis. According to this explanation, adverse consequences engendered by health problems (e.g., chronic pain), result in higher levels of NA. This explanation has considerable intuitive appeal, and has been supported empirically (Powell, Johnston, & Johnston, 2008). Similar to Powell et al. (2008), our findings that NA influences self-reports of physical health and self-reports of physical health influence NA across time show support for both the psychosomatic hypothesis and the disability hypothesis.

Our finding that self-reports of physical health are related to subsequent PA, but that PA is not related to subsequent reports of physical health, challenges recent research focusing on PA as a predictor of physical health (Lyubomirsky et al., 2005). Although studies have shown that PA predicts longevity (Levy et al., 2002), and is related to self-reports of physical health (Mroczek & Spiro, 2005), other studies have found no association (Kaplan & Camacho, 1983) and others have found detrimental effects of PA on health (Devins et al., 1990). There are multiple reasons why some studies, including the current one, do not consistently show support for the idea that PA influences physical health. First, it may be that there are missing mediators and moderators from the model. Pressman and Cohen (2005) propose that PA may lead to improved health through mediating variables such as increased social ties and improved health practices. Alternatively, PA may serve as a stress buffer. There may be important moderators, as well, such as age. For example, older individuals may derive greater subsequent health benefits from PA. Second, it may be that the discrepancies are due to researchers using various conceptualizations and operationalizations of PA, varying from optimism and hope to well-being and PA. Our findings suggest that the relationship between PA and physical health may be complex, and may vary depending on the sample and situation.

In the present study, affect and personality were assessed simultaneously at Time 1. Our model tested the possibility that personality influences moods. If personality does influence moods, the effects probably occur through direct paths, as well as indirectly via mediating variables. Results from the current study show that Neuroticism was related directly to NA, as well as indirectly through self-reports of physical health. Extraversion, however, was directly related to PA, but we did not find evidence to support indirect paths through physical health.

To explain why Extraversion and Neuroticism are associated with higher levels of PA and NA, respectively, two explanations have been proposed. First, the temperamental explanation (Larsen & Ketelaar, 1991; Rothbart, 1991; Tellegen, 1985) suggests that Neuroticism and Extraversion are manifestations of biologically-based systems that engender varying susceptibility to experiencing PA and NA. This susceptibility may arise either from differential sensitivity to positive- or negative-affect stimuli or from differences in the magnitude of responses to such stimuli. Second, the instrumental explanation (Larsen & Ketelaar, 1991) suggests that personality dimensions such as Extraversion and Neuroticism promote differences in the behaviors in which individuals engage. These lifestyle differences, therefore, bring about different long-term levels of PA and NA.

The present results suggest that both explanations may have merit. The finding that Neuroticism exerted mediated effects on mood via physical health is consistent with an instrumental explanation. The indirect effect of Neuroticism on NA via health suggests that individuals high on this personality dimension are more likely than other individuals to notice and complain about health problems. In this regard, Watson and Pennebaker (1989) suggested that neuroticism reflects individual differences in the perceptual sensitivity to somatic sensations. According to these investigators, the increased somatic complaining of individuals high in Neuroticism may be due primarily to their increased tendency to notice bodily sensations, particularly minor aches and pains, and to interpret these bodily sensations as indicators of illness. This, in turn, may lead to higher long-term levels of NA. However, in addition to this indirect effect of Neuroticism on NA via health complaints, substantial direct effects of personality on mood were also observed. The finding of direct effects is not incompatible with the temperamental view since, in the case of Neuroticism, it suggests that differences in the frequency of health complaints cannot entirely account for the elevated NA of individuals high on Neuroticism.
Interestingly, this same pattern of results was not replicated for Extraversion. Although Extraversion demonstrated a robust relationship with PA, Extraversion was not directly related to physical health. Thus, for Extraversion, the temperamental, but not instrumental, explanation was supported. The mechanisms that explain these associations with PA and NA have not been firmly established, but two that seem plausible are empathy, a process which connects individuals to others emotionally, and generalized liking for other people. Both of these mechanisms tie individuals to others, and the direction and strength of these ties would have corresponding beneficial or harmful implications for interpersonal relations.

4.1. Future research

Future research should expand the findings from the current study to include objective measures of physical health. The current study contributes to our understanding of how personality and mood contribute to reports of physical health, and it will be important to see how these findings generalize to immune functioning, cardiovascular illness, and other physiological indicators of health. Another important area for future research concerns other samples of participants. We studied personality, affect, and health among healthy, young college students. Future research should examine how personality, affect and health are related among older individuals, and also among individuals who are ill. Finally, future research should investigate the current study’s finding that there may be unobserved concurrent causal influence on affect and health, and examine other theoretically-related variables in the modeling of longitudinal personality, affect, and health, such as social relationships.

4.2. Limitations

The data presented here are based on self-reports, which bring with them several interpretative problems. First, there is a potential problem of subjective bias. That is, two individuals who are indistinguishable in terms of health status may report large subjective differences in health. It might be argued that a more objective assessment of health status would be desirable. A second, related problem with the present study is monomethod bias. That is, the same person who reported on health also reported on personality and affect. For purely methodological reasons alone, we would expect correlations among measures to be larger when all measures are completed by the same respondent than when measures are completed by different respondents. This result is due to shared biases in completing paper-and-pencil measures across instruments (e.g., Shadish, Cook & Campbell, 2002). Had we collected objective measures of health, such as physicians’ ratings of health, blood pressure, immune system functioning, or number of visits to physicians or clinics, outcomes may have been different. It is important to note, however, that what brings most patients to physicians’ offices is their subjective evaluation of their health; self-appraisals of physical health also predict important health variables such as mortality (Han et al., 2005) and illness severity (Pennebaker, 1982). One strength of this study was the use of longitudinal data, collected at times when participants were coping with a number of stressors. The time interval used, however, was 30 days, which may not have been enough of a time lapse for physical health to change substantially. In addition, the use of only three waves of measurement and a moderate (N = 360) sample size precluded tests of more refined latent trait-state models that could potentially partition the lagged relationships between affect and physical health after each had been partitioned into state and trait components. Finally, the participants in this study were primarily White, middle-class college students. As such, the generalizability of these findings is limited and future research should examine participants from varying demographic backgrounds. In particular, examining these relationships among older individuals is recommended, due to the strong relationship between physical health and age.

4.3. Concluding remarks

We employed a rigorous longitudinal structural equation modeling analysis to test the proposed relationships among affect, personality, and health. It should be noted that the ability to test associations among variables that were corrected for random measurement error avoids potential attenuation bias and the underestimation of relationships. The fact that the effect sizes that characterize the associations between affect and physical health are likely modest to begin with underscores the utility of using structural equation modeling when examining associations among these constructs.

The hypotheses entertained here about the separate relational systems surrounding PA and NA are necessarily speculative and preliminary. Conceptual and methodological gaps remain in our understanding. Conceptually, the present investigation focused on the links among mood, personality, and physical health to provide insight into the differential relations among these constructs. Modern dispositional approaches to emotion have shown that PA and NA are probably not bipolar opposites, or even substantially correlated with each other. If this claim is true, then it becomes necessary to identify the separate systems surrounding the two major dimensions of mood. Recent theory has specified links between positive mood and Extraversion, on one hand, and negative mood and Neuroticism on the other hand (Watson & Clark, 1997;
Watson & Tellegen, 1985). The connections described in the present study represent a reasonable expansion of the nomological network, and suggest further avenues for research on affect. The present research is unusual in its use of longitudinal assessment of links among personality and emotional processes. Given the recent focus on positivity, our finding that positive affect does not predict health after controlling for NA serve as a caution for those who wish to see happiness as the answer to all ailments. Our intention in writing this article is certainly not to say that happiness is not important, but rather that the conditions under which positive affect predicts health are yet to be discovered. Our findings serve as a springboard for researchers wishing to examine how and why the relationship between positive NA and health occurs (see Table 1).

References


