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Citation for the original published paper (version of record):

Rydstedt, L., Johnsen, S., Lundh, M. et al (2013). The conceptual roles of negative and positive affectivity in the stressor-strain relationship. *Europes Journal of Psychology*, 9(1): 93-103.  
<http://dx.doi.org/10.5964/ejop.v9i1.537>

N.B. When citing this work, cite the original published paper.

## Research Reports

# The Conceptual Roles of Negative and Positive Affectivity in the Stressor-Strain Relationship

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## Abstract

The purpose of this study was to compare the data/model fit for two competing theories of the conceptual roles that Negative Affectivity (NA) and Positive Affectivity (PA) play in the stressor-strain relationship. In the 'trait model', NA is understood to be a confounder that inflates the perceived work-related stressor-outcome relationship, while PA is unrelated to either stressors or strain. Alternatively, the 'situational model' assumes that NA and PA are directly affected by stressors and are thought to mediate the stressor-relationship. The sample consisted of 731 Swedish engine room officers. Role stress was used as a stressor indicator, perceived stress was the outcome measure, and the PANAS was used to assess levels of affectivity. The path analysis gave strong support for the work situational model (RMSEA = 0.034) while no support was found for the trait model. No moderating effects from affectivity were found.

**Keywords:** Negative Affectivity, Positive Affectivity, role stressors, mediators, perceived stress

Europe's Journal of Psychology, 2013, Vol. 9(1), 93–103, doi:10.5964/ejop.v9i1.537

Received: 2012-10-15. Accepted: 2012-12-21. Published: 2013-02-28.

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Over the last decade, there has been an ongoing debate on the conceptual role of Negative Affectivity (NA) in the stressor-strain process. According to [Watson \(1988\)](#), most emotions can be classified as falling under either Positive or Negative Affectivity. While Positive Affect (PA) refers to pleasurable engagement with the environment, NA “is a general factor of subjective distress and subsumes a broad range of aversive mood states” ([Watson, 1988](#), p. 1020). Furthermore, it was initially suggested by Watson and colleagues ([Watson, 1988](#); [Watson & Clark, 1984](#); [Watson, Clark, & Tellegen, 1988](#); [Watson & Pennebaker, 1989](#)) that affectivity was a two-dimensional construct where PA and NA were independent and thus uncorrelated. However, in light of further empirical evidence, [Watson, Wiese, Vaidya, and Tellegen \(1999\)](#) later modified the independence assumption and acknowledged a small but persistent negative relationship between PA and NA.

## The Relationship Between Negative Affectivity, Perceived Working Conditions and Health

Several authors (e.g. [Brief, Burke, George, Robinson, & Webster, 1988](#); [Burke, Brief, & George, 1993](#); [Watson & Clark, 1984](#); [Watson et al., 1988](#); [Watson & Pennebaker, 1989](#); [Watson et al., 1999](#)) suggest that NA is a dispositional trait, independent of actual situational or environmental conditions. Individuals high in NA are thought to perceive and report their health as bad and environmental/situational conditions as unfavourable, regardless of actual health status or “objective” quality of their surrounding, e.g., their working conditions. According to [Watson and Clark \(1984, p. 465\)](#), individuals with high NA are “more likely to experience discomfort at all the times and

across situations, even in the absence of overt stress". In accordance with the dispositional the trait model these authors suggest that NA may contribute to artificially high stressor-strain relationships in studies based exclusively on self-reported data. Therefore, the proponents of the trait view recommend controlling for the influence of NA in occupational health studies, particularly for studies with cross-sectional design and self-reported data (e.g., Brief and colleagues, 1988; Burke et al., 1993).

Other authors have questioned the conceptual role of NA as a confounder that artificially inflates the stressor-strain associations. Negative emotions have been shown to be accompanied by various physiological responses, (Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000). A replication of the study by Brief et al. (1988) basically failed to support the confounding effects of NA (Jex & Spector, 1996). In a longitudinal study of students preparing to become school teachers, Schonfeld (1996) found that NA measured pre-employment (just after graduation from college) did not have any substantial influence on the relations between later self-reported work environment factors, depression or job satisfaction. In a longitudinal study by Spector, Chen, and O'Connell (2000), with a sample of university students, trait NA was initially measured during their studies, while work-related stressors and strain were measured when the participants had joined the workforce. The results from this study indicated that the later work-related stressor-strain relationships were not significantly affected by prior trait NA (Spector, Chen, et al., 2000).

The results from several epidemiological studies also raise doubt about the assumption that NA is unrelated to actual health outcomes. After adjusting for a number of established risk factors, Jonas and Lando (2000) found high baseline Negative Affectivity (measured by self-reported depression and anxiety) to be a significant predictor of future hypertension in a large population-based epidemiological study. Similarly, after adjustment for established risk factors, Wilson, Bienias, Mendes de Leon, Evans, and Bennett (2003) found that NA significantly predicted mortality in a sample of elderly.

Based on a thorough review on the conceptual role of NA, Spector, Zapf, Chen, and Frese (2000) concluded that "NA can play a variety of substantive roles in the job stress process" (p. 79) and should therefore not *a priori* be considered as a confounder. Controlling for NA may lead to the elimination of true variance, and thus, an underestimation of the impact of job stressors on health/wellbeing. As one of several possible mechanisms of NA in the stressor-strain relationship, Spector, Zapf, et al. (2000) suggested a causal/mediational link between job stressors and NA, i.e., job stressors may in part explain NA and mediate the effect of stress exposure to strain outcomes. This theory was supported by a cross-sectional study by Höge and Büssing (2004).

Furthermore, Spector, Zapf, et al. (2000) suggested an alternative moderating role of NA, the so called hyper-responsivity assumption, suggesting that high NA persons may show elevated reactivity to stress exposure. While some studies have found support for the hyper-responsivity assumption (Fortunato & Harsh, 2006; Moyle, 1995; Parkes, 1990), Höge and Büssing (2004) failed to verify this assumption when testing the different conceptual roles for NA that were suggested by Spector, Zapf, et al. (2000).

### The Relationship Between Positive Affectivity and Health

Watson and colleagues (1999) claimed PA to be unrelated to perceived stress and to health outcomes. The activation of positive emotion appears to undo or counteract the physiological responses activated by distress reactions (Fredrickson & Levenson, 1998; Fredrickson and colleagues, 2000). According to a review by Isen (2004), an activation of positive emotions makes people better and more creative at solving problems, and may also improve

their handling of interpersonal conflicts. [Fortunato and Harsh \(2006\)](#) found PA positively related to perceived sleep quality. It has also been shown that individuals who are better at coping with stress may handle stressful situations by activating or maintaining positive emotions ([Tugade, Fredrickson, & Barrett, 2004](#)). On the whole, it would appear that positive emotions can act as a buffer against distress. A possible reason for the shortage of evidence for a relation between stress and PA may be that these relations do not appear in low stress situations ([Pressman & Cohen, 2005](#)). A thorough literature review by [Pressman and Cohen \(2005\)](#) also found evidence for an association between PA and lower morbidity.

### **Purpose of the Present Study**

The purpose of this exploratory study was to compare two competing models underlying the assumptions of the role of NA/PA in the work-related stressor-strain relationship: (1) a trait model where NA is assumed to act as a confounding agent to inflate the true stressor-strain relationship, while PA is assumed to be unrelated to perceived stressors as well as to the outcomes; and (2) a work situational model where NA as well as PA are treated as mediators in the stressor-strain relationship.

### **The Hypothetical Models of Conceptual Roles for Affectivity in the Stressor-Strain Relationship**

The constructs of role conflict and ambiguity has been used extensively in the literature as a model for explaining work-related stress and strain. It is assumed that role stress can occur both when the responsibilities of an employee are unclear and when the employee must handle conflicting interests. An important theoretical consideration is whether positive and negative mood should be considered to be trait-like concepts that influence perceived role stress, or whether PA and NA can be influenced by work role conflict and role ambiguity. While the associations between mood and personality are apparent (e.g. [Costa & McCrae, 1980](#); [Watson et al., 1999](#)), it is important to illuminate whether PA and NA can be influenced by factors in the work environment.

The hypothesized model in [Figure 1.A](#) is thus in accordance with the conclusions of, e.g. [Watson, Pennebaker, and Folger \(1987\)](#), and conceptualizes NA as a confounder that artificially inflates the relationship between work-related stressors and strain outcomes, while PA is expected to not influence the stressor-strain relationships. On the other hand, the Work situational model depicted in [Figure 1.B](#) predicts work-related stressors to have a direct impact on strain as well as to affect NA and PA which in turn affect the strain outcomes. In this model negative as well as positive affectivity are thus assumed to in part mediate the impact of work-related stress on strain outcomes.

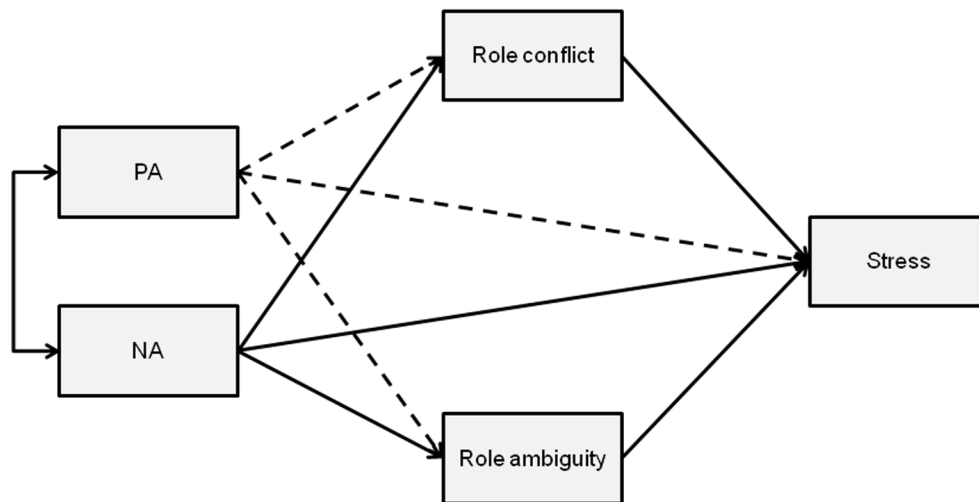
## **Method**

### **Procedure**

A survey was distributed to all engine crew members affiliated to the labour union - Swedish Merchant Marine Officers Association - who holds the only reliable address register over the target group. A requirement from the labour union was that the participants were guaranteed complete anonymity therefore the researchers could not keep any records on individual participants. The labour union administrated the questionnaires. Two reminders were sent mainly to the home addresses of all participants.

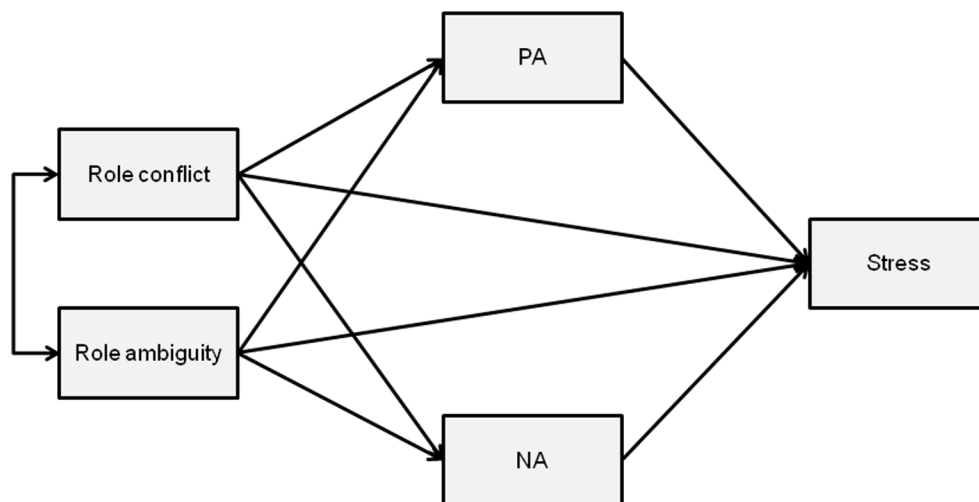
### **Participants**

The participants consisted of 1383 machine room engineers, and a total of 731 (54%) of them completed the questionnaire. The mean age of the sample was about 47 years ( $SD = 11.6$ ), where the vast majority 719 individuals



A. Trait model

Figure 1.A. Trait model: NA as causal agents to perceived work-related stressors and strain outcomes (the dashed lines indicates that no impact from PA should be expected).



B. Work situation model

Figure 1.B. Work situational model: The impact of role stress in part mediated by PA/NA to perceived strain.

were men (two participants failed to report sex); 99% were Scandinavian citizens; 76% of the participants were married/had a partner; and 41% had children. The mean number of years in their current position was about 13 years ( $SD = 10.5$ ) and their total experience at sea was on average about 24 years ( $SD = 12.8$ ). The positions on board represented in the sample were chief engineer (44.5%), second engineer (29.5%), third engineer (14.0%) and electrical engineer (11.5%). Even though the participants were not asked about their education level, the Swedish Regulation on Qualification Requirements for Sea-personnel (Sjöfartsverket, 2007, p. 37) requires at

least a bachelor degree in engineering for most of the maritime engineering positions. The few female engine room officers participating in the original study were excluded in order to obtain a more homogenous sample. The final sample for this study thus consisted of 719 persons.

### Instruments

As indicators of job stressors, a slightly shortened version of the Role Conflict and Ambiguity Scale from NIOSH Generic Job Stress Questionnaire was used (National Institute for Occupational Safety and Health, 1988). Initially developed by Rizzo, House, and Lirtzman (1970) (<http://www.cdc.gov/niosh/topics/workorg/>), the scale has been extensively used to study chronic role stress (e.g. Fried, Shirom, Gilboa, & Cooper, 2008; King & King, 1990). It contains in all 12 items, 8 on conflict (Cronbach  $\alpha$  .76), e.g., “do you receive incompatible requests from two more persons?”, and 4 on ambiguity (Cronbach  $\alpha$  .78), e.g., “do you feel certain about how much authority you have?”. The scale has five Likert-type response alternatives and was coded so that a higher numerical value means a higher degree of role stress. An earlier study on the same sample of engine officers showed that role stress was the job stressor that had the strongest impact on perceived stress and mental health (Rydstedt & Lundh, 2010).

To measure NA and PA, the well-established PANAS scale (Watson, Clark, & Tellegen, 1988) was used. The scale consists of 20 adjectives in all, ten related to NA and ten to PA, with 5 Likert-type response alternatives. The  $\alpha$  coefficients were .85 for NA and .90 for PA, respectively.

As an indicator of stress, the 10 item version of the Perceived Stress Scale - PSS10 ( $\alpha$  .84) was used (Cohen & Williamson, 1988). The time frame referred to was “the last month”, and each item has five response alternatives (0 never - 4 very often). Example of items in the scale are: “In the last month, how often have you been angered because of things that were outside your control” - “In the last month, how often have you felt that things were going your way?”

### Statistical Analyses

Path analysis, as implemented in AMOS 16 (Arbuckle, 2007), was applied to test the fit between the theoretical models depicted in Fig. 1 and Fig. 2 and the current sample. Maximum-likelihood estimation was used. Missing values were estimated by the use of a maximum likelihood procedure. In addition to regression weights and the amount of variance explained by predictors, several fit statistics are reported. The chi-square statistic represents the difference between the covariance matrix restricted to the path model and the unrestricted covariance matrix (Byrne, 2010). A significant p-value here is an indication that the model should be rejected, however in practice this may be too strict a criterion (see Byrne, 2010). The comparative fit index (CFI), with values that range from zero to 1.00, is reported. For a well-fitting model this value should be greater than 0.95 (Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) should not be greater than 0.10 for models with acceptable fit, and for well-fitting models it should be between 0.0 and 0.6 (Hu & Bentler, 1999; MacCallum, Browne, & Sugawara, 1996). The Tucker-Lewis index (TLI) is also reported and it is similar to CFI in range and cut-off value (Hu & Bentler, 1999).

To analyze the moderator assumptions of NA/PA, linear hierarchic regression analysis was used. The four multiplicative interactions between the stressors (conflict, ambiguity) and PA/NA were initially calculated. Each combination of stressors and NA/PA were entered in the first step of the equations while the actual interaction term was entered in the second step – as the indicator of a possible moderating effect.

## Results

In Table 1, the descriptive measures and inter-correlations for the variables in the study are presented. All the inter-correlations were of significant magnitude, and as could be expected, the two aspects of role stress were highly related.

Table 1

*Inter-Correlations (Pearson's  $r_{xy}$ ) for the Variables in the Study*

		<i>M</i>	<i>SD</i>	1	2	3	4
1	Positive Affect	3.43	0.52				
2	Negative Affect	1.73	0.55	-.12			
3	Role conflict	2.45	0.52	-.34	.43		
4	Role Ambiguity	2.04	0.64	-.32	.32	.53	
5	Stress	1.798	0.59	-.33	.54	.56	.39

Note. All inter-correlations  $p < .01$ .  $N = 719$ .

All the scales in this study were also used in a nationwide survey among British job holders (Devereux, Rydstedt, Kelly, Weston, & Buckle, 2004). A comparison between the sea farers and data from the 254 male participants in the sub-major occupational group (Office for National Statistics, 2000) "engineering professionals" showed that the ERO's reported significantly higher PSS ( $t = 8.96$ ;  $p < .001$ ;  $df = 968$ ) and NA ( $t = 8.29$ ;  $p < .001$ ;  $df = 927$ ) than the shore-based professional engineers but at the same time also reported a significantly higher PA ( $t = 5.12$ ;  $p < .001$ ;  $df = 929$ ). While there were no significant differences between the groups with regards to perceived role conflicts, the ERO's reported significantly lower role ambiguity than the British engineering professionals ( $t = -8.85$ ;  $p < .001$ ;  $df = 970$ ).

Initially the degree of fit between the theoretical model and the sample data was examined. The resulting path model is shown in Figure 2. All regression weights are statistically significant at the level of 0.01, except for the weight from role ambiguity to perceived stress ( $p = 0.165$ ). This model could account for 45% of the variance in perceived stress, the predictor variables role conflict and role ambiguity accounted for 20% of the variance in NA and 15% of the variance in PA. The fit of this model was excellent ( $\chi^2 = 1.8$ ,  $df = 1$ ,  $p = 0.175$ , CFI = 0.99, TLI = 0.99, RMSEA = 0.034).

The next step was to attempt to fit the trait version of the model to the current sample (Figure 1.A not including PA). The trait model suggested above showed an unacceptable model/data fit ( $\chi^2 = 163.4$ ,  $df = 1$ ,  $p = 0.000$ , CFI = 0.788, TLI = -1.124, RMSEA = 0.476).

The hierarchical regression analyses failed to significantly support any moderating effects from the influence of either Negative Affectivity (\*conflicts  $R^2 = .002$ , n.s; \*ambiguity  $R^2 = .001$ , n.s) or Positive Affectivity (\*conflicts  $R^2 = .001$ , n.s; \*ambiguity  $R^2 = .000$ , n.s) on the stressor-strain relationship.



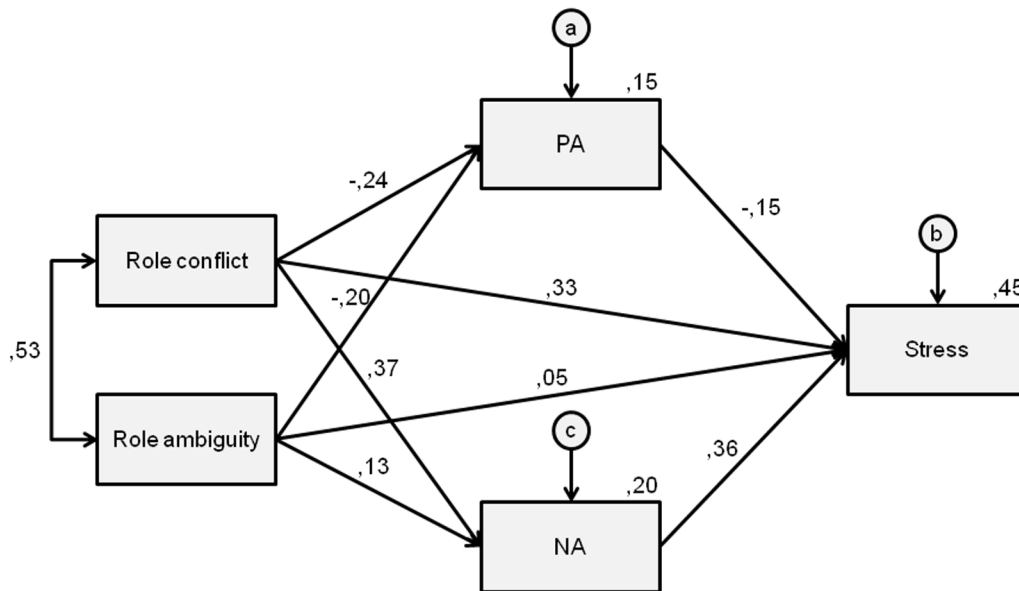


Figure 2. The best fitting structural model of the relations between role stressor, NA/PA, and Perceived Stress.

## Discussion

While the dispositional model of the role of positive and Negative Affectivity exhibited an unsatisfying fit to the data and failed to conceptualize the relationships between the construct of the suggested model, the work situational model showed a very good model-data fit and revealed several significant pathways in the stressor-strain process. The work situational model gave an explained variance of 45% in the outcome variable – Perceived Stress. Thus, the results from this study strongly support the work situational model in favour of the dispositional model. It can sometimes be the case that small adjustments to a model with fit statistics that are close to being acceptable lead to the discovery of models that fit the data significantly better. The statistics reported here were considered to indicate such a bad fit with the data that there was no reason to consider entering an explorative phase with the testing of revised models. The models presented here were constructed within two theoretical frameworks, both of which have some merit. Thus, it is fair to say that the theoretical frameworks correspond to competing models. The possibility of testing competing hypothetical models is one advantage of structural equation modeling and the present research demonstrates one way of approaching this, that is, the alternative models approach suggested by Jöreskog (1993).

Thus, similar to the study of Höge and Büssing (2004), this study also offered support for the causal/meditational mechanism (Spector, Zapf, et al., 2000) between NA and perceived stress. The third assumption tested in this study, the moderator role of NA/PA, is less feasible for SEM analyses and was therefore tested by linear hierarchic regression analysis. As in the study by Höge and Büssing (2004), this assumption was not given any empirical support in the present study.

An earlier study based on the same sample, where the associations between the working conditions and mental wellbeing were analysed, found role conflicts to be strongly related to mental wellbeing (Rydstedt & Lundh, 2010).



Furthermore, a study from the Swedish merchant fleet revealed that rapid technical development and increased requirement for efficiency and profitability have led to new role requirements, while the social work organization has not been adjusted to properly meet these new work tasks (Lützhöft, Ljung, & Nodin, 2008). The seafarers also felt that they had not achieved any proper training or complementary education to handle new systems, e.g., digital system control. Nonetheless, despite higher NA and higher perceived stress, the seafarers reported lower frequencies of role conflicts than the British engineering professionals. A possible explanation for this may be that a generic scale like the Role Conflict and Ambiguity scale does not fully capture the more occupation specific stressors among seafarers.

As one alternative role of NA, Spector, Zapf, et al. (2000) suggested a selection function. Workers with high NA may be less competitive on the labour market and therefore end up in lower and more strenuous positions. Selection may possibly offer a feasible explanation in some occupations but this hypothesis seems unlikely to explain the elevated NA in this sample of highly qualified professionals. Job type and qualification levels of the participants may be one possible reason to explain the discrepant findings regarding the role of NA in the stress process, as previously reported in the literature. Another source of constant conflict associated with mental wellbeing was the interference between work and family (Rydstedt & Lundh, 2010).

The relatively weak albeit significant correlation between NA and PA ( $r_{xy} = .12$ ) offers support for dependence between those two constructs as proposed by Watson et al. (1999). On the other hand, in this study PA was significantly negatively influenced by role stress and, in turn, mediated some of the impact from this environmental stressor to perceived stress. This contradicts the suggestions by, e.g. Watson et al. (1987) that PA is unrelated to the perception of either strenuous environmental factors or subjective wellbeing and adds to empirical support of the influence of PA in relation to health (e.g., Pressman & Cohen, 2005).

Since the full anonymity requirement only made it possible to use a cross-sectional study design, NA was initially used as a control variable for the relations between workload and perceived mental well-being, as recommended in the literature. According this tradition, NA/PA are considered to be traits and therefore the time frame was set at “in general/usually”. During the data analyzes, it was although noticed that the ERO’s reported comparatively high levels of NA. The time frame given for reporting NA/PA thus favoured the trait mechanism.

The cross-sectional design is another obvious limitation of the present study and precludes conclusions regarding causal relationships. The sample was restricted to males with relatively high average age and education levels, which may restrict the possibilities to generalize the findings to other groups of wage earners. It should also be kept in mind that the work-related stressors as well as the outcome variable were self-reported and it would be of interest for future research to find out whether the mediating role of NA would also be supported by objective indicators of the working conditions and/or psycho-physiological strain indicators.

## Conclusions

In the occupational health literature, NA has often been conceptualized as a relatively stable trait that artificially inflates the stressor-strain relationship since individuals high in NA tend to report their working conditions negatively, as well as their health, regardless of objective conditions. The findings in the present study suggest that NA may in fact be affected by the working conditions and act as a mediator between exposure and reactivity. Furthermore, the findings presented in this study indicate that PA may also play a crucial role in the stressor-strain relationship by buffering the impact of stressor exposure on health reactivity.

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