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RUNNING HEAD: Extending the procrastination-health model

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“I’ll look after my health, later”: A replication and extension of the procrastination-health model
with community-dwelling adults.

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Abstract

Initial investigations into the links between procrastination and health in student samples implicated stress-related and behavioural pathways. However, it is unknown if these relations are the same for community-dwelling adults, or if alternative measures of procrastination and health behaviors will yield the same results. To replicate and extend previous findings 254 adults recruited from the community and the Internet completed self-report measures of procrastination, health, stress, wellness and household safety behaviours. Consistent with previous work, procrastination was associated with higher stress, more acute health problems, and the practice of fewer wellness behaviours. Procrastinators also reported fewer household safety behaviours, and less frequent dental and medical check-ups. The structural equation modeling analyses revealed that stress fully mediated the procrastination-health relationship, but health behaviours did not when the combined effect with stress was considered. These findings suggest that in addition to hindering a variety of health-related behaviours, procrastination may confer additional risk for increased stress, and consequently more health problems.

“I’ll look after my health, later”: A replication and extension of the procrastination-health model with community-dwelling adults.

Procrastination is a common and pervasive problem characterized by self-regulation difficulties in the form of delaying the start and/or completion of necessary and important tasks (Ferrari & Tice, 2000). From an individual differences or trait perspective procrastination is known to have several negative consequences for emotional well-being, including anxiety and depression (Ferrari, 1991; Flett, Blankstein, & Martin, 1995). Emerging research has revealed that chronic procrastination may also take a toll on physical health with procrastinators reporting higher stress and more health problems (Sirois, Melia-Gordon, & Pychyl, 2003; Sirois & Pychyl, 2002; Tice & Baumeister, 1997), and less frequent practice of health protective behaviours (Sirois, 2004a, 2004b; Sirois et al., 2003). The proposed ways in which procrastination may adversely affect health are in line with the theoretical models linking personality to health in general, and suggest that the poor health of procrastinators may be explained directly by the stress resulting from procrastination, and indirectly by the tendency to put off important health behaviours (Sirois et al., 2003).

The procrastination-health model

How procrastination is related to health is an emerging research area which combines theory from personality and health psychology. In accordance with these theories (Friedman, 2000; Suls & Rittenhouse, 1990), the procrastination-health model initially proposed by Sirois et al. (2003) suggests that procrastination may affect health through both direct and indirect routes. The direct route includes the creation of unnecessary stress through procrastination, and its associated psychophysiological reactivity which may then lead to changes in immune function that can adversely affect health. The indirect route involves behavioural paths and the interaction

of personality with the environment, which may result in the delay of health-protective behaviours and the promotion of unhealthy behaviours. Moreover, stress and health behaviours are known to be related and may have a combined effect on health.

Central to this model is the notion that factors such as stress and health-behaviours mediate the procrastination-health relationship. To date, there is support for stress and delayed medical visits, but not health-promoting behaviours, as mediators of the effects of procrastination on health (Sirois et al., 2003). However, procrastination has been linked to less frequent health protective behaviours (Sirois, 2004a, 2004b) and the practice of unhealthy behaviours (Sirois & Pychyl, 2002) in student samples. The lack of support for health behaviours as a mediator in the procrastination-health model may be because the students were relatively young and healthy and therefore more resilient to the effects of poor health behaviours. Testing the procrastination-health model with adult samples of varying age and health states is needed to gain a clearer understanding of the mediators involved in this model.

Alternatively, previous research may have failed to support health-promoting behaviour as a mediator in the procrastination-health model because these behaviours were examined individually (Sirois et al., 2003). According to the Suls and Rittenhouse (1990) “personality as predictor of dangerous behaviour” model, it is the combination of unhealthy behaviours rather than the frequency or magnitude of any one behaviour that predicts illness risk. Testing several health-related behaviours in combination may be necessary to more accurately assess their mediational role.

Extending the procrastination-health model

Previous research linking procrastination to health has focused only on trait procrastination as measured with Lay’s General Procrastination Scale (GPS; Lay, 1986). Some

researchers have suggested that Lay's scale assesses arousal procrastination, procrastination motivated by the "thrill" of completing tasks at the last minute (Ferrari, Johnson, & McCown, 1995), and that trait procrastination can also take the form of avoidant procrastination, which is motivated by the fear of failure or success (Ferrari et al., 1995). However, whether decisional procrastination, the tendency to put off decisions (Milgram & Tenne, 2000), is associated with health-related outcomes remains to be examined.

Studies have consistently linked trait procrastination to the Big Five personality factors Conscientiousness (Lay, 1997; Milgram & Tenne, 2000), and to a lesser degree Neuroticism (Lee, Kelly, & Edwards, 2006). Conscientiousness, which includes the facets of achievement-striving and self-discipline (Costa, McCrae, & Dye, 1991), is well known to predict a variety of health behaviours including wellness behaviours (e.g., proper diet and exercise) and accident control (e.g., fixing household hazards; Booth-Kewley & Vickers, 1994). However, decisional procrastination has only been linked to Neuroticism (Milgram & Tenne, 2000). Neuroticism, which includes the experience of negative emotions and vulnerability to stress, may negatively impact health through both increased stress and fewer positive health behaviours (Booth-Kewley & Vickers, 1994; Sergerstrom, 2000). Given these differential links with Conscientiousness and Neuroticism, trait and decisional procrastination appear to be distinct subtypes of procrastination, which may be differentially related to health outcomes. Thus, the procrastination-health model may extend to other measures of trait procrastination but not to decisional procrastination.

The present study

Although these initial investigations have provided interesting and valuable insights into the procrastination-health relationship, several methodological issues limit the generalizability of these findings. The primary goal of the current study was to address these issues by replicating

and extending the previous procrastination-health research with a community-dwelling adult sample. Using a revised procrastination-health model (Figure 1) this study examined how trait procrastination may be related to health, stress and health behaviours with structural equation modelling (SEM). The SEM approach is appropriate for testing this model as it provides a powerful test of complex path analyses that accounts for measurement error (Bollen & Long, 1993). SEM permitted an examination of trait procrastination and health behaviours as latent constructs rather than as single indicators, and a test of the theorized covariance between stress and health behaviours and their role as mediators in the procrastination-health relationship. A secondary goal was to explore the possible relation of decisional procrastination to health-related outcomes, and of procrastination to household safety behaviours as these associations have not been previously examined. Although safety behaviours may not have direct effects on immediate health, they may nonetheless be related to procrastination.

Methods

Participants and procedure

A sample of 254 people completed the survey package. The majority of the sample was female (70.0%), and from Canada (59.3%) and the United States (36.8%), with the remaining participants from Europe (1.6%) and Australia (1.6%). The mean age of the participants was 33.8 years ($SD = 12.4$), and ranged from 16 to 74 years. The majority of the participants self-identified as Caucasian (73.7%), and the remainder were Asian (17.5%), African American (2.8%), Hispanic (2.8%), Aboriginal (1.6%), and other (1.6%).

Participants were recruited online and from the community. Online recruitment notices were placed on sites advertising psychological studies, and on various message boards. Notices and displays with questionnaires advertised the study in several community centers in Windsor,

Canada. Participants were given the choice of completing the survey online or having the survey sent by mail. All but 37 participants completed the survey online.

Materials

The mail-in and online surveys contained the same sets of questions and measures, including a set of demographic questions and measures of procrastination, physical health problems, health behaviours, and stress.

Physical health. The number and type of health problems was assessed using the Brief Medical History questionnaire (Sirois & Gick, 2002). The checklist includes 13 acute physical health problems (e.g., colds, headaches, digestive problems) experienced within the past 6 months. Scores for the acute health problems scale is calculated by summing the number of health problems checked.

Lay's General Procrastination scale (GPS; Lay, 1986). This 20-item scale assesses global tendencies towards procrastination across a variety of daily tasks. Items are scored on a 5-point Likert-type scale ranging from 1 (*false of me*) to 5 (*true of me*). The scale includes 10 reverse-scored items, and the sum of all items yields a single score with high values indicating a higher tendency to procrastinate. The GP has demonstrated good internal consistency ($\alpha = 0.82$; (Lay, 1986). The internal consistency for the current sample was very good ($\alpha = .90$).

The revised Adult Inventory of Procrastination (AIP-R; McCown & Johnson, 2001). This recently revised 15-item measure assesses chronic task delay motivated by avoiding task unpleasantness. It is similar to the original measure except for the addition and removal of one item. Because of the pejorative nature of procrastination the scale creators recommend using distracter items in between the scale items. Five distracter items were used in the current study. The AIP-R includes 7 positively and 8 negatively keyed items scored on a 7-point Likert-type

scale ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). High scores indicate a greater tendency towards task avoidant procrastination. This scale has demonstrated good internal consistency ($\alpha = .84$, $N = 984$; McCown & Johnson, 2001). The Cronbach's alpha for the current study was .88.

Decisional procrastination. The tendency to delay making decisions was assessed with the 5-item procrastination subscale of the Melbourne Decision Making Questionnaire (MDMQ-P; Mann, Burnett, Radford, & Ford, 1997). Items were rated on a 5-point response scale ranging from 1 for *false* to 5 for *true of me*. This scale has demonstrated good internal consistency ($\alpha = .81$, $N = 2018$; Mann et al., 1997) and had good reliability in the current study ($\alpha = .87$).

Stress. The degree of stress experienced in the past 2 weeks and 6 months was assessed with two items each rated on a 10-point scale. Response options ranged from 1 for *not stressful at all* to 10 for *extremely stressful*. Two additional items "I work or live with a lot of stress in my life" and "I feel I am under stress" placed within the AIP-R as distracter items were also used. The final stress latent variable was composed of these four items with higher values indicating higher self-reported stress.

Wellness behaviours. The frequency of performing health maintaining behaviours was assessed with the Wellness Behaviour Inventory (WBI; Sirois & Pychyl, 2002) a revised version of the Wellness Behaviours Checklist previously used to assess health-promoting behaviours in relation to procrastination. This 10-item measure assesses how often common health behaviours (e.g., healthy eating, exercising) are performed on a 5-point scale with responses ranging from 1 (*less than once a week or never*) to 5 (*every day of the week*). After reverse keying 2 items, a mean was calculated to produce an overall score with higher scores indicating more frequent performance of wellness behaviours. Reliability analysis of the WBI in the current study

revealed adequate internal consistency ($\alpha = .75$).

Health-care behaviours. The performance of preventive health-care behaviours was assessed with two items, “I see the dentist for regular check-ups” and “I see the doctor every year for my annual physical”. Each item was scored on a 5-point scale with response options ranging from 1 (*false*) to 5 (*true of me*).

Household safety behaviours. The monitoring and performance of household safety behaviours was assessed with 8 items created for this study. Items such as “I make sure that the smoke alarm is tested regularly to make sure it is functioning properly (e.g., has fresh batteries)” were scored on a 5-point scale with response options ranging from 1 (*false*) to 5 (*true of me*). In the case that participants may not have been responsible or capable of attending to these tasks they were instructed to answer according to any actions that were taken to ensure that the person who was responsible was aware of what needed to be done. This scale demonstrated good internal consistency ($\alpha = .84$).

Results

Data Screening

Data were first screened by examining the electronically received survey responses to ensure that each was a unique response. Duplicates and surveys that were missing 20 percent or more of the required responses were not included in the analyses of the final sample of 254. All variables satisfied the conditions for univariate normality according to analyses with AMOS 6.0.

Descriptive statistics

The scores on the GP ($M = 53.05$, $SD = 12.9$) in the current sample were comparable to those reported in previous research with adults samples (GP, $M = 53.9$, $SD = 12.9$; Blunt & Pychyl, 2000). The AIP-R scores ($M = 46.53$, $SD = 14.6$) were slightly higher than those reported for adult samples in the United Kingdom ($M = 40.91$, $SD = 5.5$) and the United States

($M = 35.67$, $SD = 4.4$; Ferrari, O'Callaghan, & Newbegin, 2005). The study sample also scored lower on decisional procrastination ($M = 2.45$, $SD = 0.85$) compared to other adult samples ($M = 3.88$, $SD = 2.39$; Mann et al., 1997).

The bivariate correlations among the procrastination, stress, health behaviour, and health variables are presented in Table 1. Consistent with previous research procrastination assessed with the GPS and the AIP-R was associated with higher stress, a greater number of acute health problems, the practice of fewer wellness behaviours, and less frequent dental and medical check-ups. Stress was associated with poor health and less frequent wellness and health-care behaviours, which in turn were related to poor health.

Decisional procrastination was associated with fewer household safety and wellness behaviours and higher stress, but not health. Household safety behaviours were not linked to either stress or health, but were negatively associated with trait procrastination.

Measurement model of the procrastination-health relationship

AMOS 6.0 was used to assess the fit of the measurement model to the data. One factor loading for each latent construct was fixed to 1 and the paths among the three latent variables and the single indicator variable were allowed to correlate. Several indices were used to assess the model fit: (i) chi-square statistic; (ii) RMSEA (root mean square error of approximation); (iii) IFI (Incremental Fit index); (iv) TLI (Tucker-Lewis fit index). The model is considered to have a very good fit if the IFI and TLI are greater than 0.95, the RMSEA is below 0.05, and the chi-square statistic is non-significant (Bollen & Long, 1993). A test of the measurement model indicated a very good fit to the data: $\chi^2(30, N = 254) = 43.43$, $p = .054$, *ns*; RMSEA = 0.04 (90% CI: 0.00 – 0.07); IFI = 0.99; TLI = 0.98.

Structural model of the procrastination-health relationship

The stress and health behaviour mediation model was tested following the recommendations of Holmbeck (1997). Given the overall good fit of the partially mediated model, the direct paths from the predictor (procrastination) to the mediators (stress and health behaviours), and to the criterion (acute health problems) were then tested sequentially by constraining the paths between the mediators and acute health problems to zero. Constraining the covariance between the mediators allowed for a test of each of the nested mediation paths within the model. The path coefficients from procrastination to stress ($\beta = .29, p < .001$), health behaviours ($\beta = -.65, p < .001$), and health problems ($\beta = .18, p < .01$), were each significant in the predicted directions. Next, the path from procrastination to stress and the covariance between stress and health behaviours were each constrained to zero to test the direct path from stress to acute problems, which was significant ($\beta = .27, p < .001$). The direct path from health behaviours to acute problems was tested in a similar manner, and was also significant ($\beta = -.22, p < .01$), suggesting that when the covariance with stress is not considered health behaviours may mediate the procrastination-health relationship. Given the statistical significance of the covariance between stress and health behaviours ($\beta = -.27, p < .01$), and the theoretical reasons for including this parameter, the direct path between health behaviours and acute problems was tested again after including the stress-health behaviours covariance. This path was not significant ($\beta = -.10, p = .26$) indicating that health behaviours was not a significant mediator after considering the covariance with stress.

The final step for establishing mediation involves comparing the partial and full mediation models (path from procrastination to acute problems constrained to zero), and if there is no significant improvement in fit then mediation is supported (Holmbeck, 1997). The fully mediated model also revealed a very good fit to the data: $\chi^2(31, N = 254) = 43.86, p = .063, ns$; RMSEA =

0.04 (90% CI: 0.00 – 0.07); IFI = 0.99; TLI = 0.98, with no change in the fit indexes as compared to the partially mediated model. The chi-square difference between the two models was also non-significant, $\Delta\chi^2 = 0.43$, suggesting that stress fully mediated the effects of procrastination on health (Figure 2).

Bootstrapping analyses of the mediation

The significance of the mediation effect for stress was tested using AMOS 6.0 bootstrapping following the procedure suggested by Shrout and Bolger (2002) and applied by Lee et al. (2006). After generating 1,000 bootstrap samples from the data set ($N = 254$) using random sampling with replacement, the full mediation model was tested 1,000 times with the bootstrap samples, and the mediation effect estimated by multiplying 1,000 pairs of path coefficients for the indirect effect. The significance of this effect at the .05 level is supported if the 95% CI for the estimates of the mediation excludes zero (Shrout & Bolger, 2002). For the current analyses the effects were estimated with maximum likelihood estimation and 100% of the bootstrap samples converged. According to the bootstrapping analyses the mean mediation effects from procrastination through stress to acute health problems was significant ($b = 0.35$ 95% [CI: 0.09, 0.72]). The magnitude of this effect was $\beta = 0.27 \times 0.29 = 0.08$, indicating that 8% of the variance in self-reported acute health problems was explained by the stress mediation effect in the procrastination-health model.

Discussion

The purpose of the current study was to replicate and extend the procrastination-health model by examining the mediating roles of stress and health behaviours with a community-dwelling adult sample, and by using different measures of trait procrastination. Overall, the proposed model was partially supported by the current results, with stress, but not health

behaviours, fully mediating the relationship between procrastination and health when the joint effects of stress and health behaviours were considered. However, when the role of stress was not considered, health behaviours mediated the effects of procrastination on health.

The support for a procrastination-health model fully mediated by stress in the present study is in contrast to the previous test of the model in which stress only partially mediated the effects of procrastination on health (Sirois et al., 2003). This may be in part due to the younger and healthier students tested in the previous study who may have been less vulnerable to the negative effects of stress than the adults in the present study. Another possible explanation is that the structural equation modelling (SEM) analyses allowed for a more powerful test of the relations among procrastination, stress, and health by using not one but two measures of procrastination, and by examining several types of health behaviours. Consistent with Sergerstrom's (2000) conjecture that behavioural factors can work independently or in conjunction with personality-related stress to negatively impact the immune system and increase the risk for illness, the SEM analyses found support for both the independent and the reciprocal effects of stress and health behaviours on the health of procrastinators.

The range of health behaviours examined in the current study replicates and extends the types of health-related behaviours known to be hindered by procrastination. This is the first study to find that procrastination is related to fewer household safety behaviours. Although it was expected that safety behaviours would not be associated with recent health problems, the long range implications of not engaging in this type of health behaviour can be potentially harmful. For example, recent estimates suggest that 13.3% of Canadians age 12 and over sustain personal injuries in the home (Statistics Canada, 2002). In the United States there are nearly 20,000 deaths due to unintentional home injuries per year, with an average of 21 million medical visits

resulting from injuries in the home (Home Safety Council, 2004). Because safety issues within the home can affect all household members, the poor practice of behaviours to keep the home safe puts not only the health of procrastinators at risk but also risks the health and safety of their families.

Conscientiousness is considered by some to be the best predictor of health behaviours and health outcomes among the Big Five Factors (Booth-Kewley & Vickers, 1994; Friedman et al., 1995). The stronger negative link of Conscientiousness with chronic procrastination (Lee et al., 2006; Milgram & Tenne, 2000), but not with decisional procrastination (Milgram & Tenne, 2000) found in other studies may explain why decisional procrastination was only weakly related to stress and illness in this study. Due to its association with Neuroticism, decisional procrastination was moderately related to both wellness and safety behaviours, a finding that is unique to this study.

Despite the methodological improvements of the current study, there are some limitations which should be addressed. Ideally, an assessment of the links between procrastination, health behaviours, stress, and health should be assessed over time to fully establish the directionality of the causal links suggested by the mediation in this cross-sectional study. Future investigations of the links between procrastination and health should take a prospective approach to clarify the associations suggested here. This is especially important when examining the links between procrastination and health behaviours which may not have noticeable immediate effects but can have pervasive long-term effects on health. In addition, the range of health behaviours examined in the current study did not include risky health behaviours such as smoking and substance use, which have been linked to procrastination (Sirois & Pychyl, 2002). Future tests of the procrastination-model should also examine the role of these potentially harmful behaviours.

Although the use of Internet sampling may at first appear as a limitation regarding the characteristics of the sample obtained for this study, this method of sampling may be seen as a potential strength of the study for several reasons. Lavoie and Pychyl (2001) have described the Internet as "a virtual procrastination field" making an Internet-based survey an ideal methodology for examining how procrastination is linked to health. Moreover, Krantz and Dalal (2000) have demonstrated that Internet studies produce samples that are larger and more heterogeneous than those obtained from the community, and in this respect may be more representative than their community-based counterparts.

Conclusions

In conclusion, this study extends the previous research on the procrastination-health model by finding that trait procrastination is linked to poor health in adults, and that this association is best explained by stress. Support for the indirect effects of health behaviours on the health of procrastinators is an important contribution of the present study to our understanding of the far reaching effects of procrastination on health. By hindering health-care check-ups and the practice of wellness behaviours procrastination may confer additional risk for increased stress, and subsequently more health problems.

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Table 1. *Intercorrelations Among the Procrastination, Stress, and Health-related Variables.*

Scale	1	2	3	4	5	6	7	8	9	10	11
1. General Procrastination Scale	---										
2. AIP-R	.79**	---									
3. MDMQ-P	.60**	.60**	---								
4. Acute health problems sum	.17**	.15*	.07	---							
5. Stress past 2 weeks	.13*	.18**	.17*	.20**	---						
6. Stress past 6 months	.14*	.22**	.09	.27**	.67**	---					
7. AIP-R filler 1	.19**	.25**	.15*	.18**	.64**	.58**	---				
8. AIP-R filler 2	.19**	.24**	.17**	.24**	.68**	.62**	.77**	---			
9. Wellness Behaviours Inventory	-.34**	-.36**	-.23**	-.12*	-.25**	-.30**	-.24**	-.26**	---		
10. Medical check-ups	-.22**	-.22**	-.12*	-.12*	-.04	-.13*	-.12	-.12	.35**	---	
11. Dental check-ups	-.30**	-.32**	-.12	-.08	-.11	-.13*	-.07	-.06	.20**	.27**	---
12. Household safety behaviours	-.45**	-.42**	-.34**	-.03	-.02	-.04	-.05	-.10	.23**	.27**	.31**

Note: * $p < .05$, ** $p < .01$; AIP-R = Adult Inventory of Procrastination Revised; MDMQ-P = Melbourne Decision Making Questionnaire procrastination scale.

Figure 1: Proposed structural model of the procrastination-health model. The latent variables are enclosed in ellipses and the measured variables are enclosed in rectangles. The dashed line indicates a non-significant path after controlling for the effects of the mediators.

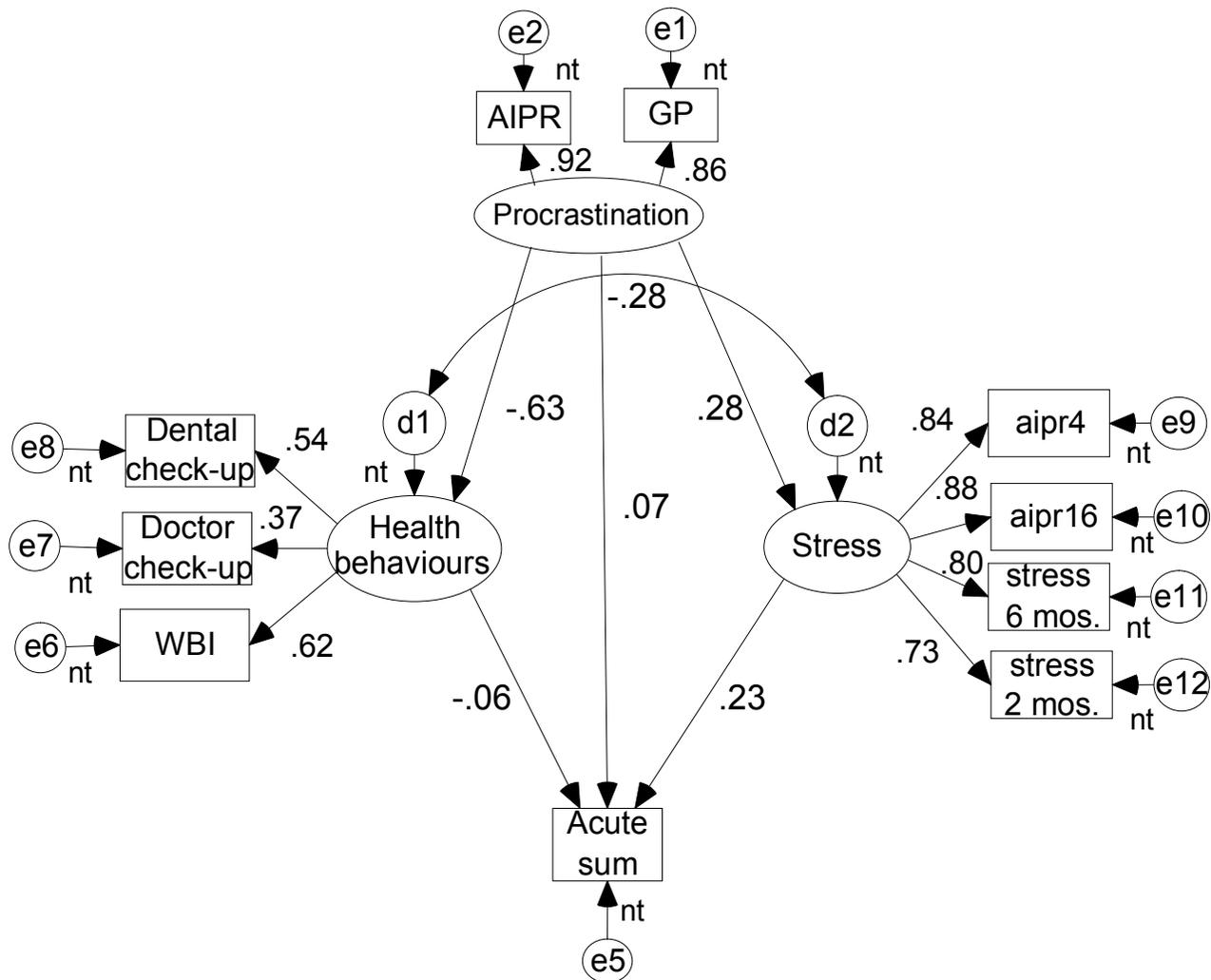


Figure 2: The procrastination-health mediation model. *Note:* The latent variables are enclosed in ellipses, the measured variables are enclosed in rectangles, and the small circles reflect residual variances. Paths from residuals (η) were fixed to 1. AIP-R = Adult Inventory of Procrastination Revised; GP = General Procrastination scale.