



A methodological tool for work-related stress management: Importance-Performance Analysis used complementary to PLS path modelling

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1. Introduction

Work-related stress

- **A major public health issue:** it has negative effects on both physical and psychological health
- Although stress is an inevitable part of organizational life, effort can be made to reduce its negative effect on health:
 - job characteristics (**stressors**) impacting a high level of perceived stress **well-documented;**
 - impact of each stressor measured in a **multidimensional way.**

Quantitative assessment

- Theoretical frameworks have been successful in generating and collecting data on work-related stressors;
- **Limited** literature on **quantitative assessment** of stressors impact on work-related stress considering the **multidimensional aspect** of this type of data.

2. Study data

Stress & stressors data

- Provided by **Stimulus** (expert in occupational health & wellbeing) → **10 000** anonymous employees randomly drawn from different companies.
 - Tools:
 - 1st questionnaire on **work-related stress**
 - 2nd questionnaire on **job characteristics**
- both administered to employees during their routine visit in preventive medicine service.

Stress

- 1st questionnaire: 25 items to measure individual psychological stress at work
→ 8-point Likert scale.
- Example:
“I'm confused and I lack focus and concentration” ,
answer varies from 1 *“not at all”* to 8 *“enormously”*

Stressors

- 2nd questionnaire: 58 items to measure the impact of job characteristics (stressors) → 6-point Likert scale.
- Ex. 1: *“My company does not care about employees well-being”* (negative)
answer varies from 0 “totally disagree” to 5 *“totally agree”*
- Ex. 2: *“I know clearly what I am expected to do at work”* (positive)
answer varies from 0 “totally agree” to 5 *“totally disagree”*

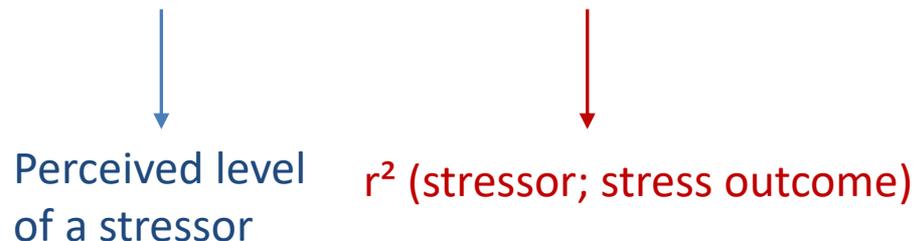
3. Cooper's index limitations

Clarke, S. G., & Cooper, C. L.. The risk management of occupational stress. *Health, Risk & Society* 2000.

Cooper index

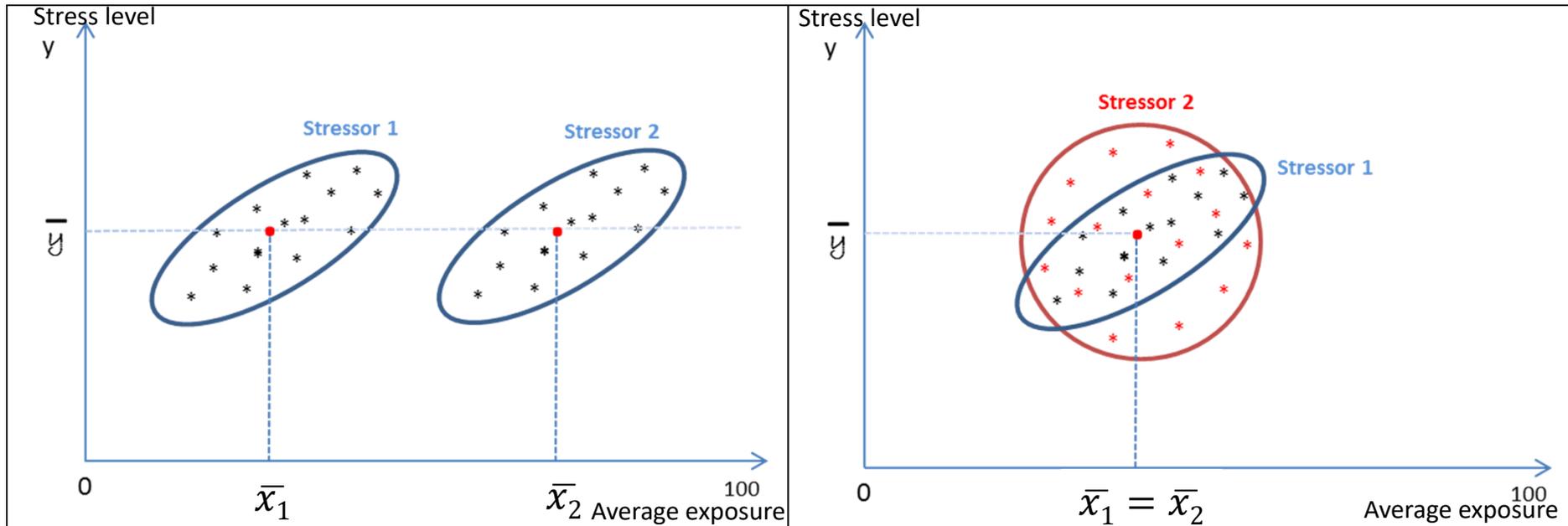
- Prioritize professional stressors impacting work-related stress → **Cooper index**
- **Aim:** provides companies a quantitative risk assessment approach to prioritize psychosocial risks at work.
- **Approach:** identify **stressors** related to high stress level:

Risk factor = exposure x consequences



Limits (1)

1) Easy to use but questionable! $r^2 \times \bar{x}_1$ m is not a risk (or an impact) measure



Same variability, same correlation, $\bar{x}_2 > \bar{x}_1$.
 → x_1 and x_2 have the same risk. However, using Cooper's index, x_2 should be riskier than x_1 !

$\text{Cor}(Y, x_1) > \text{Cor}(Y, x_2)$, x_2 more variable $\bar{x}_2 = \bar{x}_1$
 → x_2 is riskier than x_1 However, using Cooper's index, x_1 should be riskier than x_2 !

Limits (2)

2) No consideration of inter-correlations between stressors!

3) Confusion between **correlation and causality!** acting on a stressor could cause changes in other stressors

4. Suggested approach

Suggested approach

1) PLS path modeling:

- To **investigate** the impact of job characteristics on perceived work-related stress in a **multidimensional way**

2) Importance-performance analysis:

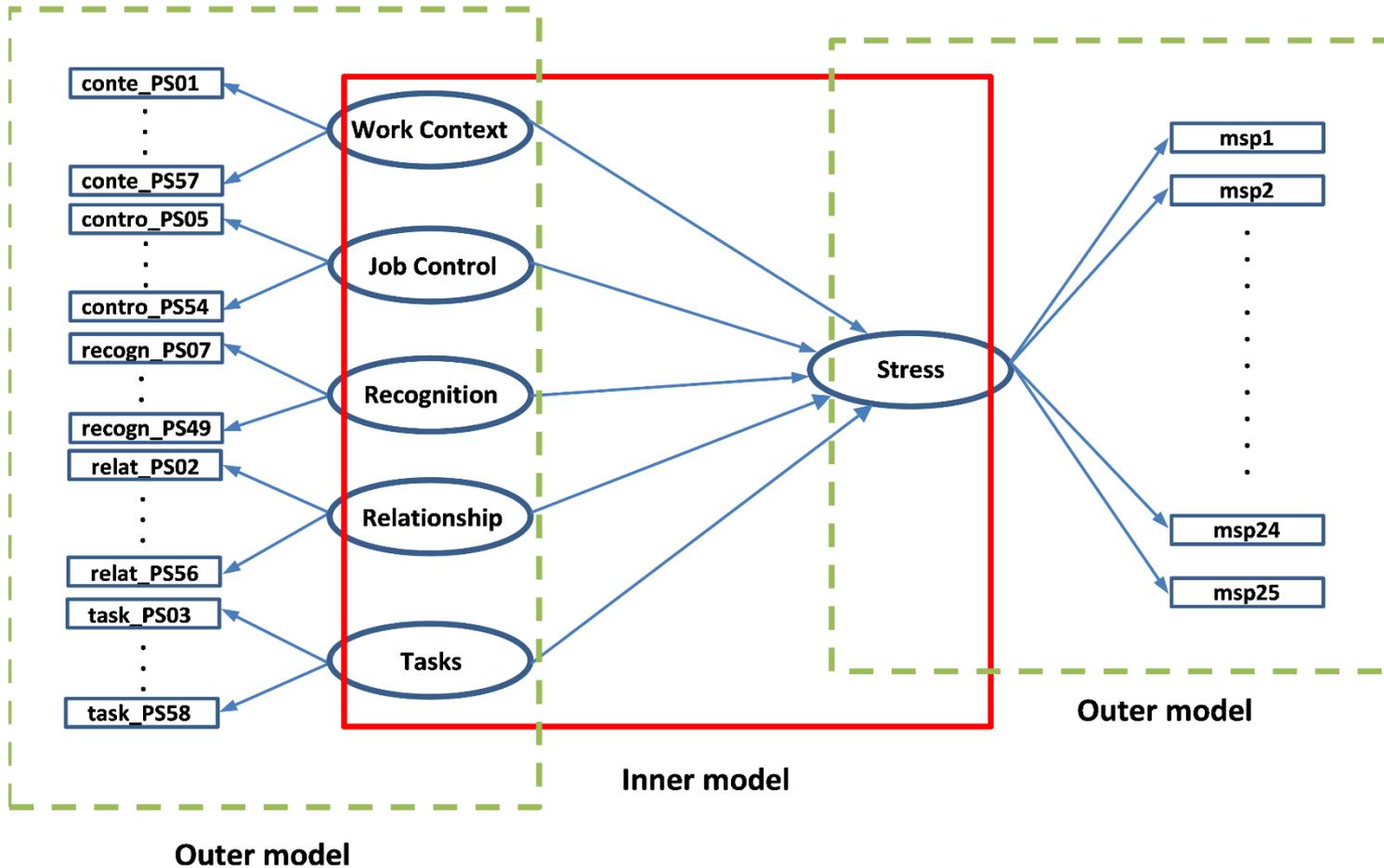
- To **identify** stressors requiring a priority action

Martilla, J. A., & James, J. C. Importance-performance analysis. *The journal of marketing* 1977.

4.1. PLS Path Modeling

Esposito Vinzi, V., & Russolillo, G. Partial least squares algorithms and methods. *Wiley Interdisciplinary Reviews: Computational Statistics* 2013.

Conceptual model



Homogeneity of the 6 blocks

Latent variables	No. of Items	1 st λ & Cronbach α	
1 st questionnaire: « stress »			
Work-related stress	25	33.6	0.94
2 nd questionnaire: « stressors »			
Work context	14	8.95	0.88
Job control	14	7.15	0.80
Relationship	12	7.01	0.87
Tasks	12	5.37	0.62
Recognition	6	5.98	0.81

Outer model

- All outer weights are statistically significant ($\alpha = 5\%$)
- ➔ Measurement model **quality is satisfactory**

Latent Var.	Manifest Var.	Outer weight	95% Confidence Interval	
Work context	Context_01	0,116	0,110	0,122
	Context_08	-0,069	-0,074	-0,064
	Context_15	-0,077	-0,082	-0,072
	Context_21	-0,096	-0,100	-0,092
	Context_23	-0,096	-0,100	-0,092
	Context_30	-0,088	-0,092	-0,084
	Context_32	-0,085	-0,089	-0,081
	Context_34	0,090	0,086	0,095
	Context_40	-0,080	-0,084	-0,076
	Context_41	0,096	0,090	0,102
	Context_43	-0,080	-0,085	-0,076
	Context_52	0,092	0,087	0,097
	Context_53	0,108	0,103	0,113
Context_57	-0,076	-0,081	-0,071	

Correlation between blocks

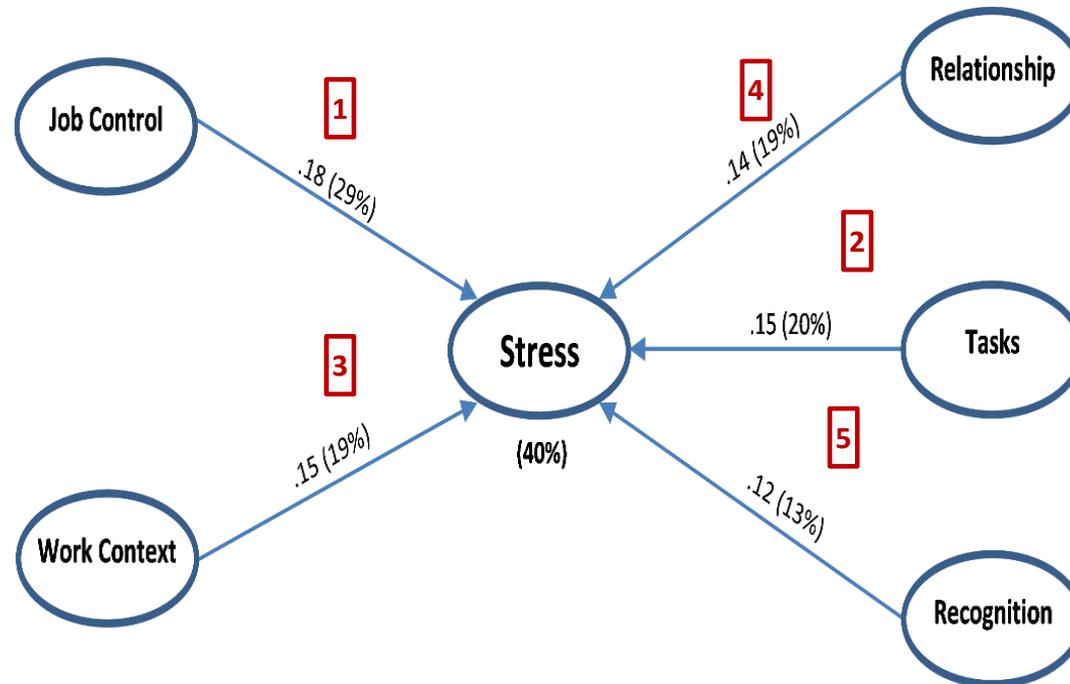
- Correlation between latent variables:

	Context	Control	Recognition	Relationship	Tasks	Stress
Context	1.00					
Control	0.78	1.00				
Recongnition	0.72	0.63	1.00			
Relationship	0.69	0.67	0.60	1.00		
Tasks	0.61	0.72	0.54	0.53	1.00	
Stress	-0.52	-0.63	-0.43	-0.51	-0.52	1.00

PLS rather than SEM

- Blocks are mutually positively and strongly related !
- PLS-path modeling is a more appropriate approach
- Structural equation model (SEM): potential collinearity might bias the results of the underlying multiple regression analysis.

Estimation of path coefficients

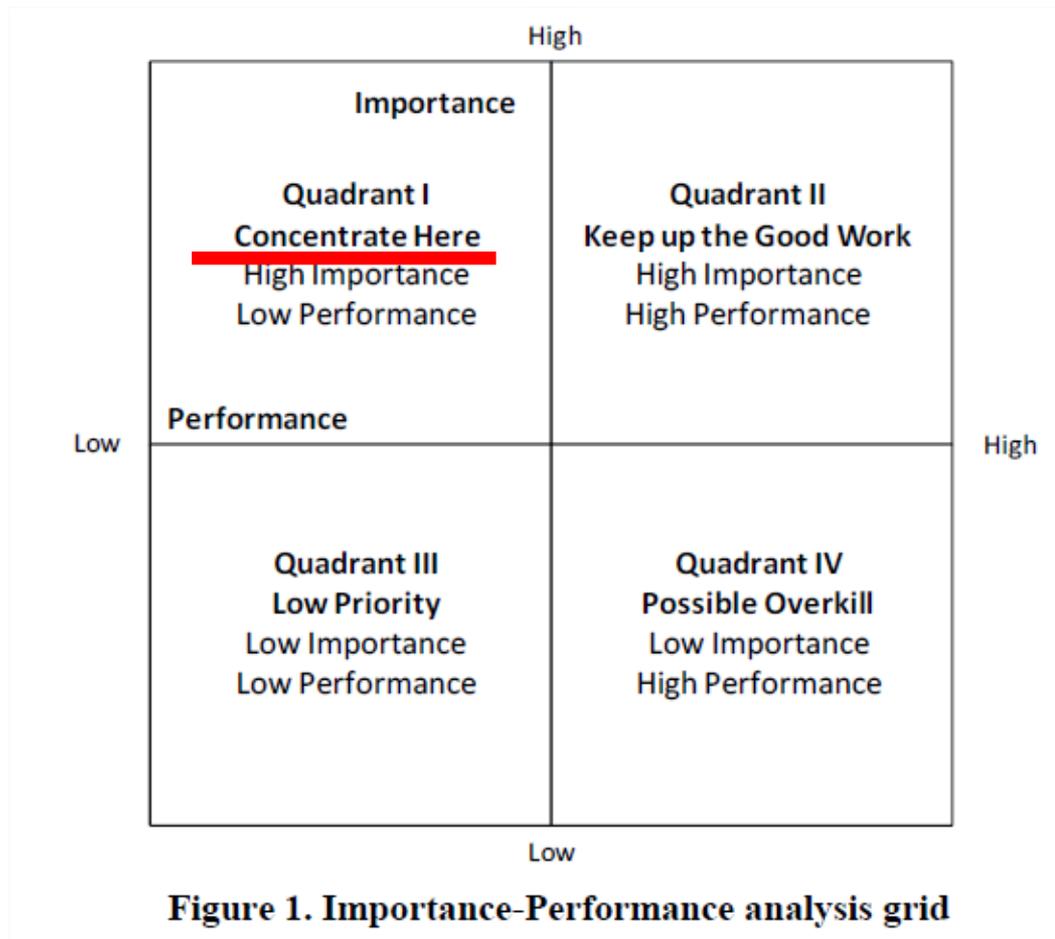


Path coefficients (contribution to R²=40%)

4.2. Importance-Performance Analysis

A graphical approach

IPA is a valuable approach for customer satisfaction studies.



Performance & Importance

Performance

Measured as the score mean over the 10 000 responses

Importance

Calculated using the suggested formulae:

Importance (k^{th} item) = |Outer weight (k^{th} item in j^{th} block)| x Path coefficient (j^{th} block, stress)

Stressors to improve

5 items were identified in Quadrant A, where **improvement** in performance **is most pressing** and **upon which the management should concentrate**:

Task_PS46: « I have to work fast in a short timeframe »

Recon_PS07: « My promotion prospects are weak »

Recon_PS17: inverse of « My company offers me interesting career opportunities »

Task_PS31: « I work in a noisy and hectic atmosphere »

Recon_PS35 : inverse of « I am rewarded when I reach my goals »

Stressors to maintain

6 items are identified in Quadrant B, where **efforts should be maintained**:

Task_PS13: « I frequently see the work pile up without being able to eliminate the backlog »

Task_PS24: inverse of « My work gives me many opportunities to perform interesting tasks »

Task_PS03: inverse of « My work means a lot to me »

Task_PS04: « My job is about monotonous and repetitive tasks »

Contro_PS09: inverse of « I can achieve professional life - personal life balance »

Contro_PS54: « I'm living or I expect to live an undesirable change that might affect my career »

Robustness analysis

- IPA's robustness against a change in the scale used to categorize the answers to the 58 items related to professional stressors was tested
- 6-point Likert scale for individuals' answers to each of the 58 items, we *dichotomized* the answers as follows:

Negative responses coded 0

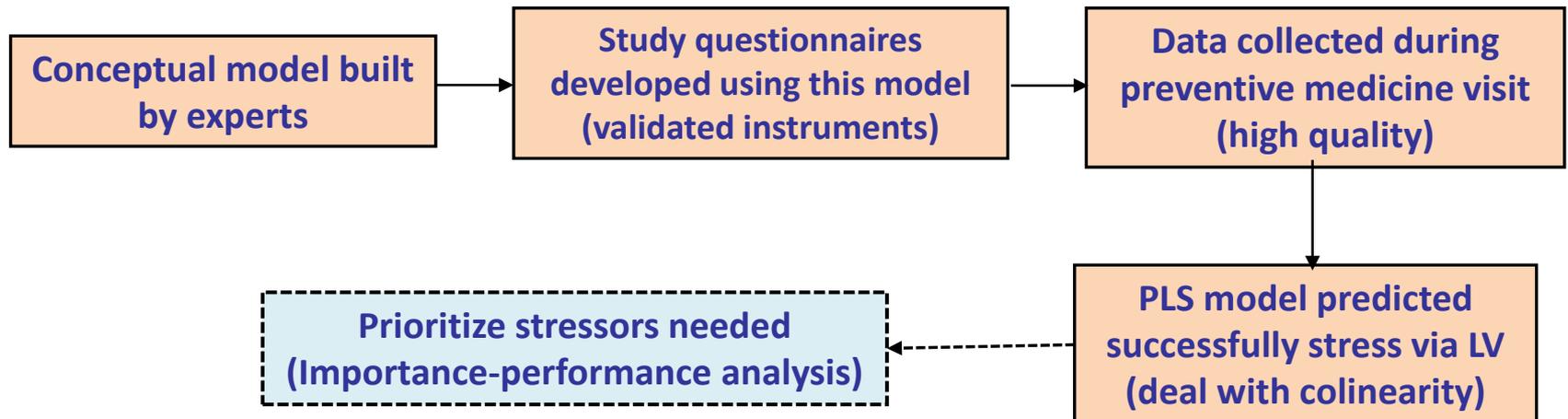
Positive responses coded 1

- Similar distribution of the items in the four quadrants.
➔ Robustness of the IPA's results.

5. Conclusion and perspectives

Conclusion

- PLS path modeling and IPA based approach could be a useful tool for the policy of psychosocial risks management at workplace
- Sequence of the performed approach:



Perspectives

Causal analysis

Correlation does not imply causality, a causal analysis should be performed to determine the stressors on which to act in order to reduce psychosocial disorders associated with stress.

→ Causal graphs (Bühlmann, P. Causal statistical inference in high dimensions. *Mathematical Methods of Operations Research* 2013).

The causal model could be validated using **longitudinal data** collected after an intervention plan on work-related stress.

References

- We combined IPA), with Partial Least Squares-Path modeling (PLS-PM), a major statistical tool widely applied in psychosocial and marketing research. PLS-PM was used to predict the impact of five blocks of stressors on work-related stress. The obtained coefficients were used to calculate item importance in IPA and directly identify items requiring priority attention. The method was shown to be robust to changes in the coding of questionnaire items.