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The OTS Cohort on Work Organization and Health: operationalization of work- related psychosocial risk exposures

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1. Abstract

The OTS Cohort is an observational open cohort study of salaried workers aged 25 years or older in Spain, designed to examine longitudinal relationships between labor management practices, work-related psychosocial risks, and health. This working paper describes the methodology developed to operationalize binary indicators of cross-sectional and sustained exposure to work-related psychosocial risks in the OTS Cohort using the Spanish short version of the Copenhagen Psychosocial Questionnaire (COPSOQ-Istas21). To derive binary exposure indicators, all scales were standardized to a 0–100 metric, and optimal cut-off points were identified using receiver operating characteristic (ROC) curve analysis and the MaxSpSe method, which maximizes the combined sensitivity and specificity for discriminating moderate-to-severe depression. Cut-off points were derived using data from a representative sample of 1,267 salaried workers in Spain recruited in 2025 as part of the IMPROnTa project. In addition to cross-sectional exposure, a longitudinal measure of sustained exposure was defined by classifying participants as exposed only if they remained in the most unfavorable category at both baseline and one-year follow-up. This approach was intended to better reflect the continuous nature of psychosocial risk exposure and to reduce potential misclassification arising from temporal fluctuations in exposure status between annual assessments. The proposed methodology provides a standardized and reproducible framework for deriving binary indicators of work-related psychosocial risks for use in future OTS Cohort studies.

2. Questions comprising the work-related psychosocial risk scales

The items used were drawn from the COPSOQ-Istas21 questionnaire (Moncada i Lluís et al., 2021), the Spanish version of the Copenhagen Psychosocial Questionnaire (COPSOQ) (Burr et al., 2019). The COPSOQ is an internationally recognized instrument that has been adapted and validated in more than 25 countries and is widely used in research and psychosocial risk assessments in the workplace. It is one of the most extensively used instruments for assessing work-related psychosocial risks and has been identified by the World Health Organization as a reference method (Leka & Jain, 2010).

Specifically, the Spanish short version was used for ten COPSOQ scales. Table 1 presents the original items in the language of administration (Spanish), and Table 2 provides their English translation.

Table 1. COPSQ-Istas21 items used in the OTS Cohort (Spanish version).

Dimensión	Código	Pregunta	Respuestas
Exigencias cuantitativas	QD1	¿Con qué frecuencia le resulta imposible acabar sus tareas laborales?	Nunca (1) Sólo alguna vez (2) Algunas veces (3) Muchas veces (4) Siempre (5)
	QD2	¿Se retrasa en la entrega de su trabajo?	
Ritmo de trabajo	WP1	¿Tiene que trabajar muy rápido?	
	WP2	¿El ritmo de trabajo es alto durante toda la jornada?	
Exigencias emocionales	ED1	¿En el trabajo tiene que ocuparse de los problemas personales de otras personas?	
Influencia	IN1	¿Tiene mucha influencia sobre las decisiones que afectan a su trabajo?	
	IN2	¿Tiene influencia sobre cómo realiza su trabajo?	
Posibilidades de desarrollo	PD1	¿Su trabajo permite que aprenda cosas nuevas?	
	PD2	¿Su trabajo permite que aplique sus habilidades y conocimientos?	
Inseguridad laboral	JI1	En los próximos seis meses, ¿cuán probable es que le despidan o no le renueven el contrato?	Muy poco o nada probable (1) Poco probable (2) Relativamente probable (3) Bastante probable (4) Muy probable (5)
	JI2	En los próximos seis meses, ¿cuán probable es que le bajen el salario?	
Apoyo social compañeros/as	SC1	¿Con qué frecuencia recibe ayuda y apoyo de sus compañeros y compañeras de trabajo, en caso de necesitarlo?	Nunca (1) Sólo alguna vez (2) Algunas veces (3) Muchas veces (4) Siempre (5)
	SC2	¿Con qué frecuencia sus compañeros y compañeras hablan con usted sobre cómo hace su trabajo?	
Apoyo social supervisores/as	SS1	¿Con qué frecuencia recibe ayuda y apoyo de su jefe/a inmediato/a, en caso de necesitarlo?	
	SS2	¿Con qué frecuencia su jefe/a inmediato/a habla con usted sobre cómo hace su trabajo?	
Conflicto trabajo-vida	WLC1	¿Siente que su trabajo le ocupa tanto tiempo que perjudica a su vida personal o familiar?	
	WLC2	¿Hay momentos en los que necesitaría estar en la empresa y en casa a la vez?	
Reconocimiento	RE1	¿Su trabajo es valorado por la dirección?	
	RE2	En su trabajo ¿recibe un trato justo?	

Table 2. COPSQ-Istas21 items used in the OTS Cohort (English version).

Dimension	Code	Question	Responses
Quantitative demands	QD1	How often do you not have time to complete all your work tasks?	Never (1) Only occasionally (2) Sometimes (3) Many times (4) Always (5)
	QD2	Do you get behind with your work?	
Work pace	WP1	Do you have to work very fast?	
	WP2	Do you work at a high pace throughout the day?	
Emotional demands	ED1	Do you have to deal with other people's personal problems as part of your work?	
Influence	IN1	Do you have a large degree of influence on the decisions concerning your work?	
	IN2	Do you have any influence on HOW you do your work?	
Possibilities for development	PD1	Do you have the possibility of learning new things through your work?	
	PD2	Can you use your skills or expertise in your work?	
Job insecurity	JI1	In the next six months, how likely is it that you will be dismissed or that your contract will not be renewed?	Very unlikely or not at all likely (1) Unlikely (2) Relatively likely (3) Quite likely (4) Very likely (5)
	JI2	In the next six months, how likely is it that your salary will be reduced?	
Social support from colleagues	SC1	How often do you get help and support from your colleagues, if needed?	Never (1) Only occasionally (2) Sometimes (3) Many times (4) Always (5)
	SC2	How often do your co-workers talk to you about how you do your work?	
Social support from supervisors	SS1	How often do you get help and support from your immediate superior, if needed?	
	SS2	How often does your immediate supervisor talk to you about how you do your work?	
Work-life conflict	WLC1	Do you feel that your work takes so much of your time that it has a negative effect on your private life?	
	WLC2	Are there times when you feel you need to be at work and at home at the same time?	
Recognition	RE1	Is your work valued by management?	
	RE2	At work, are you treated fairly?	

3. Operationalization of cross-sectional binary exposure

Determination of cut-off points

To derive the cut-off points for binary exposure classification, each scale was first standardized to a 0–100 scale. Receiver operating characteristic (ROC) curve analysis was then performed, and the optimal threshold for each scale was identified using the MaxSpSe method (López-Ratón et al., 2014), which selects the cut-off that maximizes the sum of sensitivity and specificity, thereby providing the best discrimination between participants with and without moderate-to-severe depression. To assess the robustness of the estimated cut-off points, an internal validation strategy based on repeated split-sampling was implemented. The dataset was randomly divided 50 times into a derivation (training) sample comprising 70% of participants and an independent validation (test) sample comprising the

remaining 30%. For each repetition, the optimal cut-off point was estimated in the derivation sample and its discriminatory performance was subsequently evaluated in the corresponding validation sample.

Sample

The methodology described in the previous section was applied to a representative sample of salaried workers residing in Spain. Data collection was conducted in 2025 as part of the research project PID2023-150644NB-I00, entitled *"Preventing Risks from Work Organization: What Impact Would It Have on Productivity and Drug Consumption? An Approach from Sociology and Occupational Health (IMPROnTa)"*.

The survey was administered by telephone to $n=1,267$ salaried workers residing in Spain, selected using quota sampling based on sex and occupational group (ISCO-08 one-digit major groups 1–9). Table 3 presents the distribution of the sample according to its sociodemographic and occupational characteristics, together with the corresponding figures from the Spanish Labour Force Survey.

Table 3. Characteristics of the IMPROnTa sample.

Variable	Category	IMPROnTa n (%)	EPA* %
Sex	Men	651 (51%)	52%
	Women	616 (49%)	48%
Age #	18-34	303 (24%)	27%
	35-49	532 (42%)	39%
	50-67	432 (34%)	34%
Birthplace	Spain	1045 (82%)	76%
	Other country	222 (18%)	24%
Occupation	Managers	35 (3%)	3%
	Professionals	257 (20%)	20%
	Technicians and Associate Professionals	154 (12%)	12%
	Clerical Support Workers	145 (11%)	11%
	Service and Sales Workers	262 (21%)	21%
	Skilled Agricultural, Forestry and Fishery Workers	10 (1%)	1%
	Craft and Related Trades Workers	128 (10%)	10%
	Plant and Machine Operators and Assemblers	96 (8%)	8%
	Elementary Occupations	180 (14%)	14%
Contract	Permanent	1150 (91%)	85%
	Temporary	117 (9%)	15%
Working hours	Full-time	1114 (88%)	85%
	Part-time	147 (12%)	15%

* Encuesta de Población Activa (EPA) = Spanish Labour Force Survey.

In the EPA, the "18–34" category corresponds to the 16–34 age group, whereas the "50–67" category corresponds to the "50 or more" age group.

Table 3 shows that the IMPROnTa sample closely resembled the EPA with respect to sex, age distribution, and occupational group. Small differences were observed for country of birth, contract type, and working hours, with the IMPROnTa sample including a slightly higher proportion of workers born in Spain (82% vs. 76%), workers with permanent contracts (91% vs. 85%), and full-time workers (88% vs. 85%). These differences suggest a slight underrepresentation of more precarious employment situations in the IMPROnTa sample, particularly among temporary workers and workers born outside Spain. However, the magnitude of these differences was modest, indicating that the sample remained broadly comparable to the reference population.

Cut-off point values

The scoring formula and the corresponding cut-off points are presented in Table 4. As expected, the optimal thresholds differed across scales. The area under the ROC curve (AUC), together with the corresponding sensitivity and specificity values, is also reported.

Table 4. Scoring formulas and ROC-derived cut-off points.

Scale	Scoring formula	Cut-off (exposed)	AUC	Sensitivity	Specificity
Quantitative demands	$(QD1 + QD2 - 2) \times (100 / 8)$	≥ 37.5	0.639	0.54	0.669
Work pace	$(WP1 + WP2 - 2) \times (100 / 8)$	≥ 75	0.688	0.63	0.649
Emotional demands	$(ED1 - 1) \times (100 / 4)$	≥ 25	0.571	0.627	0.5
Influence	$(IN1 + IN2 - 2) \times (100 / 8)$	≤ 50	0.586	0.506	0.617
Possibilities for development	$(PD1 + PD2 - 2) \times (100 / 8)$	≤ 50	0.611	0.556	0.64
Job insecurity	$(JI1 + JI2 - 2) \times (100 / 8)$	≥ 12.5	0.619	0.665	0.513
Social support from colleagues	$(SC1 + SC2 - 2) \times (100 / 8)$	≤ 62.5	0.646	0.646	0.518
Social support from supervisors	$(SS1 + SS2 - 2) \times (100 / 8)$	≤ 62.5	0.686	0.698	0.632
Work-life conflict	$(WLC1 + WLC - 2) \times (100 / 8)$	≥ 50	0.73	0.698	0.649
Recognition	$(RE1 + RE2 - 2) \times (100 / 8)$	≤ 62.5	0.686	0.691	0.618

Summary table

Table 5. Summary of the operationalization of cross-sectional work-related psychosocial risk exposures.

Scale	Code	Question	Responses	Scoring formula	Cut-off (Exposed)
Quantitative demands	QD1	How often do you not have time to complete all your work tasks?	Never (1) Only occasionally (2) Sometimes (3) Many times (4) Always (5)	$(QD1 + QD2 - 2) \times (100 / 8)$	≥ 37.5
	QD2	Do you get behind with your work?			
Work pace	WP1	Do you have to work very fast?		$(WP1 + WP2 - 2) \times (100 / 8)$	≥ 75
	WP2	Do you work at a high pace throughout the day?			
Emotional demands	ED1	Do you have to deal with other people's personal problems as part of your work?		$(ED1 - 1) \times (100 / 4)$	≥ 25
Influence	IN1	Do you have a large degree of influence on the decisions concerning your work?		$(IN1 + IN2 - 2) \times (100 / 8)$	≤ 50
	IN2	Do you have any influence on HOW you do your work?			
Possibilities for development	PD1	Do you have the possibility of learning new things through your work?		$(PD1 + PD2 - 2) \times (100 / 8)$	≤ 50
	PD2	Can you use your skills or expertise in your work?			
Job insecurity	JI1	In the next six months, how likely is it that you will be dismissed or that your contract will not be renewed?	Very unlikely or not at all likely (1) Unlikely (2) Relatively likely (3) Quite likely (4) Very likely (5)	$(JI1 + JI2 - 2) \times (100 / 8)$	≥ 12.5
	JI2	In the next six months, how likely is it that your salary will be reduced?			
Social support from colleagues	SC1	How often do you get help and support from your colleagues, if needed?	Never (1) Only occasionally (2) Sometimes (3) Many times (4) Always (5)	$(SC1 + SC2 - 2) \times (100 / 8)$	≤ 62.5
	SC2	How often do your co-workers talk to you about how you do your work?			
Social support from supervisors	SS1	How often do you get help and support from your immediate superior, if needed?		$(SS1 + SS2 - 2) \times (100 / 8)$	≤ 62.5
	SS2	How often does your immediate supervisor talk to you about how you do your work?			
Work-life conflict	WLC1	Do you feel that your work takes so much of your time that it has a negative effect on your private life?		$(WLC1 + WLC2 - 2) \times (100 / 8)$	≥ 50
	WLC2	Are there times when you feel you need to be at work and at home at the same time?			
Recognition	RE1	Is your work valued by management?		$(RE1 + RE2 - 2) \times (100 / 8)$	≤ 62.5
	RE2	At work, are you treated fairly?			

4. Operationalization of sustained binary exposure

For each transition from $t-1$ to t and for each dimension, participants were classified as exposed only if they fell within the category most unfavorable to health, according to the corresponding cut-off point, at both the baseline ($t-1$) and follow-up (t) assessments. All other exposure patterns were classified as non-exposed.

Table 6. Definition of sustained binary exposure.

Exposure at $t-1$	Exposure at t	Sustained exposure ($t-1 \rightarrow t$)
Non-exposed	Non-exposed	Non-exposed
Non-exposed	Exposed	Non-exposed
Exposed	Non-exposed	Non-exposed
Exposed	Exposed	Exposed

This approach was adopted because, although work-related psychosocial risks were assessed only at annual time points, exposure is inherently continuous and may change at any point during the one-year transition, while the exact timing of these changes cannot be determined. Requiring participants to be classified as exposed at both assessments was intended to capture sustained exposure over the transition and reduce potential misclassification due to fluctuations in exposure status.

5. Operationalization of the job demands-control-support model

In the OTS Cohort, selected COPSQ-Istas21 scales are combined to operationalize the three dimensions of the Job Demand–Control–Support (JDCS) model (Johnson & Hall, 1988; Karasek, 1979; Karasek & Theorell, 1990). Specifically, the demands dimension comprises the quantitative demands and work pace scales; the control dimension comprises the influence at work and possibilities for development scales; and the support dimension comprises the support from colleagues and support from supervisors scales.

Table 7. Items, scoring formulas and ROC-derived cut-off points for JDCS dimensions.

Dimension	Code	Question	Scoring formula	Cut-off (Exposed)
Demands	QD1	How often do you not have time to complete all your work tasks?	$(QD1 + QD2 + WP1 + WP2 - 4) \times (100 / 16)$	≥ 50
	QD2	Do you get behind with your work?		
	WP1	Do you have to work very fast?		
	WP2	Do you work at a high pace throughout the day?		
Control	IN1	Do you have a large degree of influence on the decisions concerning your work?	$(IN1 + IN2 + PD1 + PD2 - 4) \times (100 / 16)$	≤ 56.25
	IN2	Do you have any influence on HOW you do your work?		
	PD1	Do you have the possibility of learning new things through your work?		
	PD2	Can you use your skills or expertise in your work?		
	JI2	In the next six months, how likely is it that your salary will be reduced?		
Support	SC1	How often do you get help and support from your colleagues, if needed?	$(SC1 + SC2 + SS1 + SS2 - 4) \times (100 / 16)$	≤ 62.5
	SC2	How often do your co-workers talk to you about how you do your work?		
	SS1	How often do you get help and support from your immediate superior, if needed?		
	SS2	How often does your immediate supervisor talk to you about how you do your work?		

The area under the ROC curve (AUC) and the corresponding sensitivity and specificity values, are presented in Table 8:

Table 8. Properties of cut-off point for JDCS dimensions.

Dimension	AUC	Sensitivity	Specificity
Demands	0.695	0.673	0.614
Control	0.621	0.586	0.62
Support	0.703	0.674	0.639

The dichotomized demands and control dimensions can then be combined to classify participants into the four categories of the job demand–control model: low strain, active, passive, and high strain. In addition, the support dimension can be incorporated to identify participants experiencing iso-strain, defined as high strain combined with low social support.

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