Work, stress and health: from theoretical models to a meta-model

CRITICAL REVIEW OF THEORETICAL MODELS LINKING WORK ENVIRONMENT, STRESS AND HEALTH: TOWARDS A META-MODEL

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SYNTHÈSES

REVIEWS

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RÉSUMÉ

RECENSION CRITIQUE DES MODÈLES THÉORIQUES RELIANT ENVIRONNEMENT DE TRAVAIL, STRESS ET SANTÉ : VERS UN MÉTA-MODEL

Depuis plus d’une cinquantaine d’années, les diverses disciplines concernées par la santé au travail voient émerger des modèles théoriques expliquant l’impact de l’environnement de travail sur le stress et la santé. Les synthèses existantes (e.g. Cox, Griffiths, & Rial-González, 2000 ; Neboit & Vézina, 2002…) classent très souvent ces modèles selon leur appartenance aux approches interactionniste ou transactionnelle. Cette distinction théorique ne permet néanmoins pas de les différencier plus finement. De plus, l’attention est souvent focalisée sur les modèles les plus connus (e.g. Karasek & Theorell, 1990 ; Siegrist, 1996…) qui en éclipsent d’autres tout aussi riches sur le plan conceptuel. Ces différents éléments justifient la recension proposée ici, axée sur les modèles détaillant les relations entre l’environnement de travail, le stress et la santé au travail. Cette recension comporte deux objectifs. Elle vise d’abord à présenter les modèles théoriques dans une perspective historique, pour mettre en évidence les filiations propres à chaque courant de recherche. Le second objectif concerne la proposition d’un cadre conceptuel métathéorique, destiné à caractériser les modèles et à les comparer de façon systématique. Une recherche documentaire a été effectuée dans les bases de données relatives aux différentes disciplines de la santé au travail. Pour être inclus, les modèles devaient satisfaire des critères explicites, présentés dans l’article. Dix-sept modèles ont été retenus et rattachés à six courants différents. Ces modèles sont caractérisés selon les variables médiatrices et modératrices qu’ils convoquent ; les médiateurs sont ainsi classés en trois catégories (i.e. perception, évaluation, réactions à court-terme) et les modérateurs en cinq (i.e. caractéristiques socio-démographiques, individuelles, du travail, soutien social au travail, environnement extra-professionnel). En résumé, plus de la moitié des modèles intègrent des processus perceptifs en tant que médiateur, alors que les processus évaluatifs n’interviennent que dans trois d’entre eux. Concernant les modérateurs, les caractéristiques individuelles et socio-démographiques sont dominantes et davantage mobilisées que celles liées à l’environnement de travail. Enfin, les implications et les limites de ce cadre conceptuel sont discutées.

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I. INTRODUCTION

In western societies, occupational health (OH) gradually appears to be a “public health issue” (Vézina, 2009, p. 257). Within this context, attention is increasingly paid to occupational stress caused by the growing prevalence of its related disorders (Guiol & Muñoz, 2009). In 2005, 30 % of the European working population (within the 10-Member-State European Union) acknowledged being affected by stress (Milczarek, Schneider, & González, 2009). In 2005 again, 56 % of European workers considered that their occupational activity impacted on their health (Milczarek, et al., 2009), while only a minority of them were exposed to physical risks such as air pollution or noise (Guiol & Muñoz, 2009).

Researchers in the field of work activity have for long built theoretical models to account for the influence of work environment on health. Initially based on a “stimulus-response” principle, these theoretical models have been refined to integrate different (individual or environmental) variables that mitigate or aggravate the impact on health of work environment (Jones & Bright, 2001; Rasche & Irachabal, 2001). Some of these models predominate throughout the literature. This is especially the case of the Karasek (1979) and Siegrist (1996) models amply referred to in scientific publications, or of the Cooper and Marshall (1976) model quoted in reports of OH dedicated organisations (Brun, Biron, Martel, & Ivers, 2003; Cox et al., 2000). Next to these, there are many other theoretical frameworks, which are somewhat outshone by the “stars” on the field. This situation is harmful since these other models offer unquestionable advantages. Moreover, a researcher sometimes finds it difficult to pinpoint a model which, while relevant, goes beyond his disciplinary field because the topic of OH is essentially multidisciplinary. This multidisciplinary character is also the cause of terminological differences, thus making mutual communications more complicated.

We can base our work on existing syntheses to build an overview of theoretical tools detailing the relationships between work environment, stress and OH (Cox et al., 2000; Neboit & Vézina, 2002; Van De Leemput, 2005). It should nevertheless be stated that these reviews rarely address more than four models, thereby restricting themselves to the best known frameworks (e.g. Cooper & Marshall, 1976; Karasek, 1979; Lazarus & Folkman, 1984; Siegrist, 1996). In this sense, they neither refer to an accurate model selection criterion nor claim to achieve exhaustiveness. Besides, these reviews usually describe each model based on its own terminology. Such descriptions are certainly helpful, if we are attempting to understand the singular features of each model. On the other hand, they do not allow us to approach the models from a “meta” angle, thereby restricting the possibilities of comparing them.

When these reviews try to categorise the available theoretical tools, they often limit themselves to dividing them into two classes: interactional
models and transactional models. The so-called interactional approach “prioritizes the objective environment by trying to identify situations that exceed the adaptation capacities of individuals” (Vézina, 2002, p. 50). One of the purposes of interactional models is therefore to identify areas of risk in the organisation (Van De Leemput, 2005). Drawing on the conception of stress upheld by Lazarus (Lazarus & Folkman, 1984), the transactional approach abandons the objective environment idea to focus on “interpreting the situation, the meaning a person will assign to it” (Lancry & Ponnelle, 2004, p. 302). This approach favours studying the individual’s characteristics and his/her way of reacting to a given situation. This distinction between interactional and transactional approaches is helpful, since it emphasises the importance of considering or not considering the individual’s interpretation of a work situation. But, it is also rather discriminating in the sense that it gathers some models into a common class, overlooking essential distinctions that the conceptual framework, that we suggest here, explains and categorises (Part IV). Furthermore, it is not exclusive and, thus can be ambiguous since a model as well-known as that of Siegrist is sometimes considered as interactional (Van De Leemput, 2005; Vézina, 2002), and sometimes as transactional (Cox, et al., 2000), depending on the authors.

These different observations therefore justify a new systematic review of theoretical models, which will account for the relationships between work environment, stress and health. This review is based on an explicit literature search methodology, which we detail below. Firstly, it aims to place theoretical models in a historical perspective; it associates each model with a research stream by throwing light on successive enrichments. It subsequently offers a meta-theoretical conceptual framework describing similarities and differences between these models on a single basis. This conceptual framework is simple, but it allows systematic description; it records the presence and content of mediator and/or moderator variables (Baron & Kenny, 1986; Rascele & Irachabal, 2001) between work environment and health.

II. METHODOLOGY

II.1. LITERATURE SEARCH

A literature search was conducted using the following databases: Business Source Premier, Cairn, Francis, Econlit, Ergonomics Abstracts, Erudit – Revues, Medline, Psychinfo, and Science Direct. These databases refer to disciplines involving OH (psychology, ergonomics, sociology, medicine, management, and economics). We used various keywords to take into account terminologies used in these disciplines: health model, job characteristics, job strain, occupational stress, OH, organisational stress, psychosocial hazards, psychosocial work environment, stress model, work characteristics, work health, work environment, work organization, work-related health, and work stress. The main manuals and collective publications in the disciplines referred to above were also consulted, along with reports of OH institutions (EU-OSHA, Eurofound, INRS, etc.).
II.2. Model selection criteria

Four criteria were specified *a priori* in order to decide whether a theoretical model should be included in our review. Reference titles and abstracts prompted initial selection. When neither the reference title nor its abstract allowed us to check model compliance with the selection criteria, we referred to the publication itself as the final stage of the selection process. Close to 250 articles, 40 books and 10 institutional reports were referred to.

The first criterion requires the presence of at least three components in the theoretical model: work environment as the main independent variable, health as the main dependent variable and one or more intermediate variables between these two. As a first approximation, we characterise these intermediate variable as short-term reactions. This criterion arises from adopting a conceptual framework, which records the presence of mediator and moderator variables between work environment and health (as illustrated by Figure 7). Using this unique structure, all the selected models are described based on the categories of variables they use. Therefore, this conceptual framework also determines the definition of the three components, which must be integrated by the selected models:

- Work environment reflects a common meaning in OH literature. This heuristic conception has its roots in the Lewin (1938) field theory, which was subsequently appropriated by researchers in the occupational field (Cartwright, 1959). Within this framework, the models independent variable corresponds to the situation in which people work (French & Kahn, 1962; McGrath, 1976). Its characteristics are not only physical (temperature, noise level, etc.) and social (contact with the public, etc.), but also organisational (roles, responsibilities, etc.). In this conception, the work environment exists as such, outside individual perceptions. Knowing whether the surveyed models also integrate the existence of processes, e.g. perception of this environment, or whether they exclude such options is therefore of little importance.

- We then adopt a comprehensive conception of health, which represents the models dependent variable. Consistent with the World Health Organisation (1946) definition, this incorporates somatic, mental and social dimensions. This conception also has the advantage of addressing health in both its positive and negative connotations. It therefore falls within the scope established by the International Labour Organisation (1998), which considers health as promoting and maintaining the highest degree of employee well-being. This being the case, this conception integrates recent conceptual developments, e.g. focusing on the search for employee “optimal functioning” (Bakker & Derks, 2010), as well as more restrictive meanings.

- Finally, all the selected models explicitly include an intermediate variable between work environment and health. As we will see later, these short-term reactions vary in nature. They are frequently referred to by the term “stress”, but we have adopted a more generic expression because of the conceptual confusion associated with this notion (Lancry, 2007). These short-term reactions are considered in both their positive and negative connotations.
Work, stress and health: from theoretical models to a meta-model

The second criterion involves the work environment characteristics. To be selected, the models must describe these characteristics and the list must claim to be exhaustive. This criterion avoids integrating over-specialised models, accounting for a single work characteristic on health. The third criterion also reflects a requirement for generality. Only theoretical models applying to a wide range of occupations were selected, while those focusing on a single activity or work context were rejected.

Finally, the fourth criterion implies that the selected models must be “theoretically useful” within the meaning of Caplow (2000). According to this author, usefulness has a theoretical side (a model is useful, if it makes certain events meaningful, or prompts new questions or research paths). This criterion ensured that only models supported by a solid theoretical basis were included. Application of these criteria to the literature search findings led to selecting 17 theoretical models (Table 1). Some of these models caused to minor alternatives; these have not been shown to preserve clarity. In the discussion, we explain the limits of such criteria.

Table 1 – Models théoriques retenus suite à la revue de la littérature : courant, discipline(s), filiation(s) théorique(s), modèle princeps.

| Models |
|-----------------|-----------------|-----------------|-----------------|
| 1. French and Caplan (1972) |
| 2. Ivancevich and Matteson (1980) |
| 7. Siegrist (1996) |
| 11. Karasek (1979) |
| 12. Demerouti, Bakker, Nachreiner and Schaufeli (2001) |
| 15. Warr (1987); Warr (1994) |
III. SURVEYED MODELS: AN HISTORICAL PERSPECTIVE

III.1. INSTITUTE FOR SOCIAL RESEARCH (ISR)

In the 1950s, which enjoyed a boom in social sciences, a research programme entitled “Mental health and social environment” was launched at the University of Michigan’s Institute for Social Research (ISR). This programme was part of a renewed interest in mental health prompted by the traumatic impact of the Second World War (stress on soldiers, etc.). The full employment and growth in production of the 1960s led ISR researchers to take an interest in organisations and their impact on the life of Americans. Gradually this programme, initiated by French and Kahn, focused on health at work. Influenced by the Lewin (1938) field theory, these two researchers developed a model reflecting the relationships between work and health (French & Kahn, 1962). Referring to Lewin, this model distinguishes an objective work environment from a subjective work environment. The employee perceives an objective environment, thereby forming a subjective environment, which is the one that affects the level of stress. In turn, stress affects physical and mental health through its related physiological, affective and behavioural reactions. The original French and Kahn (1962) model also highlights the individual’s characteristics (values, personality, etc.) and his/her social environment (family, social groups, etc.). These two sets of variables accentuate or minimise the objective environment’s impact on the perceived (subjective) environment, the subjective environment’s impact on stress and, ultimately, the impact of stress on health. This original model was not selected in this review since it does not comply with the second criterion. A graphical representation of this model, based on the conceptual framework presented in the following part of the paper, nevertheless allows us to better grasp the models surveyed and affiliated to the ISR (Figure 1).

Figure 1: Simplified representation of the Institute for Social Research’s original model (adapted from French & Kahn, 1962, p. 2).
A number of researchers would subsequently complete the French and Kahn’s general framework (1962). In 1972, French and Caplan published a model essentially dedicated to heart disease, which claimed to be exhaustive in terms of work environment characteristics. In a similar vein and also relating to cardiovascular diseases, Matteson and Ivancevich (1979) presented a model, which they would later extend to health in general (Ivancevich & Matteson, 1980). These two models are similar and we only kept the 1980 publication. In 1984, the French and Kahn (1962) model was enriched by Winnubst, who detailed a set of work characteristics. In 1992, Kahn and Byosiere published a refined model based on the results of empirical studies. This is the last original model selected from this research stream.

### III.2. Person-environment fit (P-E fit)

In the 1970s, results stemming from the ISR programme led to novel conceptual development. Despite its ISR origin, the new work was sufficiently distinct to be separated from the former and it was referred to as the Person-Environment Fit (P-E Fit) research stream. Like the emblematic ISR model, the P-E Fit model (French, et al., 1982) is first composed of an objective, then of a subjective environment with the former impacting on the latter. This model is again inspired by the work of Lewin (1951) through its famous equation, which stresses the interaction between an individual and his/her environment in explaining behaviour (or health in this case). In this stream (French, et al., 1982), a lack of fit between a person (his/her capacities, goals, etc.) and his/her environment (including demands, resources, etc.) may be objective or subjective. The worse the fit, the more destructive its health impact. It is important to note that, for these authors, only the subjective fit between a person’s perception of himself/herself and his/her environment has an impact on health. A graphical representation of the French et al. (1982) model is provided below for our conceptual framework (Figure 2). Notwithstanding its influence on many models, this one was not selected because it does not meet the second criterion for this review.

**Figure 2 :** Représentation simplifiée du modèle princeps du courant de l’Adéquation Personne – Environnement (adaptée de French, et al., 1982, p. 3).

Figure 2: Simplified representation of the original P-E Fit model (adapted from French, et al., 1982, p. 3).
Based on this approach, Cooper went on to build several spin-off models (Cooper, 1986; Cooper & Marshall, 1976, 1979; Palmer, Cooper, & Thomas, 2001, 2003). These models remain similar and only the first was kept here (Cooper & Marshall, 1976). The model developed in Quebec by Dolan and Arsenault (1980, 2009) also forms part of the P-E Fit tradition. At least, this is what its authors (2009, p. 54) claim, although this link does not seem obvious, if we examine both its graphical representation and the causal chain described by them (2009, p. 55-56); there is no explicit reference to person-environment fit in either of these. Notwithstanding these authors’ claims, it would appear that the Dolan and Arsenault model stems more from the ISR stream, all the more since it broadly integrates its specificities (moderation by individual characteristics and social environment). Conversely, the Siegrist’s Effort-Reward Imbalance (ERI) model (1996) stems basically from the P-E Fit stream, even though it is not always referred to in these terms. Evaluation of the balance between Efforts and Rewards (Figure 3) is central to this model. We believe that it can be conceptually likened to evaluation of fit between the Person (his/her efforts) and his/her Environment (rewards). However, we observe that, while Siegrist is explicit concerning the subjective nature of efforts (perceived), he remains vague concerning rewards. Nevertheless, everything would lead us to believe that, if the balance between efforts and rewards is evaluated, it is then the balance between perceived efforts and perceived rewards which is evaluated.

![Figure 3: Schematic representation of the Effort-Reward Imbalance (ERI) model (Siegrist, 1996) based on the P-E Fit conceptual framework.](image)

**III.3. Job design**

In parallel with the ISR, researchers in the 1960s reflected on work characteristics likely to raise employee motivation and satisfaction. They were opposed to the Tayloristic approach to work organisation, prevalent in both the United States and Europe at that time (Gibbs & Levenson, 2002). For these researchers, it is work enrichment and not specialisation that
contributes to productivity and motivation. One of the first notable contributions to this so-called job design (or job enrichment) research stream was the Herzberg (1959) Two-Factor Theory. Hackman and Oldham (1976) pursued in this line by suggesting that there are relationships between work characteristics and three psychological states: experiencing the meaning of work, feeling responsible for one’s work and knowing its results. These three states have an impact on employee attitudes and behaviours and this impact is moderated by his/her “growth need strength” (Hackman & Oldham, 1976). This original model (Figure 4) was therefore not selected since it does not target OH (first criterion).

Inspired by these conceptions, Smith and Sainfort (1989) were the first to propose a model, which targets OH while stressing the role of perceptual mechanisms. Focused in changing work situations, this model also forms part of an ergonomic framework (Carayon & Smith, 2000). The turn of the century saw the emergence of other OH spin-offs from the Hackman and Oldham (1976) model: the Parker, Wall and Cordery (2001) model and the Humphrey, Nahrgang and Morgeson (2007) model. These authors emphasise that theories underpinning the job design stream were developed using a male population working in manufacturing facilities. Developments in the world of work, in particular tertiary sector growth, led these researchers to “update” the Hackman and Oldham (1976) model by integrating new work characteristics.

III.4. THE RESOURCE-BASED APPROACH

In the 1970s, American sociologist Robert Karasek (1979) adopted an innovative standpoint by highlighting the beneficial impact of certain work dimensions on stress and health. In common with the preceding research stream, Karasek can be considered to question the Tayloristic approach to work organisation by stressing the role of autonomy in health. His model became one of the best known in the field (Truchot, 2010). To develop this model, Karasek took up a Scandinavian research tradition, which was pioneering the issue of workers’ well-being at the time. Following rejection by the labour movement, Scandinavian research on personal abilities and behaviours (prevalent in the United States) gave way to studies of health organisational determinants (Barling & Griffiths, 2010). In this context, Karasek

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**Figure 4**: Simplified representation of original job design model (adapted from Hackman & Oldham, 1976, p. 256).
specifically based his work on studies conducted by Gardell (1971) in Sweden, which demonstrated the protective effect of autonomy at work. His theoretical model (1979) thus integrates two occupational stress determinants: work demands and control. Demands cause psychological stress (strain), in other words a state that is “unpleasant, non-productive, pathological in the long-term” (Karasek & Theorell, 1990, p. 33), while control moderates this relationship. The original model was enriched in 1990 (Karasek & Theorell) by incorporating social support, which was supposed to attenuate the consequences of work situations combining high demands and low control. The Karasek model is usually schematically represented by a table interrelating demand and control levels (high vs. low), so it can be represented by causal paths to provide inter-model comparisons (Figure 5).

![Figure 5: Schematic representation of Karasek’s model, second version (adapted from Karasek & Theorell, 1990).](image)

The Job Demands-Resources model developed by Demerouti, Bakker, Nachreiner and Schaufeli (2001) forms an extension of Karasek’s model; its authors postulate that a person has resources other than control and social support to cope with work demands. A revised model was published a few years later (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007), but it has not been empirically validated: only the 2001 model was therefore selected.

III.5. PREVENTIVE STRESS MANAGEMENT (PSM)

In the 1980s, management researchers (Quick & Quick, 1984) developed an approach aimed at providing an intervention framework in relation to OH. This approach applied preventive medicine principles (primary, secondary, tertiary prevention stages) to the work stress process. The approach bases its explanation of this process on contemporary stress theories such as that of Lazarus and Folkman (1984). In this way, extensions of the PSM research stream are found in current stress management practices. These researchers have then developed a first model (Quick, Quick, Nelson, & Hurrell, 1997) integrating 19 work characteristics. These characteristics potentially trigger a stress reaction, the health impacts of which are moderated by variables involving the individual and his/her environment (Figure 6).
The original feature of this model is that it takes into account both negative (*distress*) and positive (*eustress*) consequences of the work situation. Despite this commendable aim of contributing to the emergence of a more positive approach to OH (Nelson & Cooper, 2007), this model is still more directed towards preventing distress than promoting eustress. The holistic model of Nelson and Simmons (2003) overcomes this drawback by drawing on positive psychology (Seligman & Csikszentmihalyi, 2000). Including more than 20 work characteristics, the latter model emphasises the positive reactions (*eustress*) that these characteristics can generate. This holistic model was refined in 2007 (Simmons & Nelson) based on a reaffirmed concern in ensuring an essential position to the concept of *eustress*.

### III.6. Integrative Models

Several models combine the theoretical components put forward in the previous historical traditions, especially in the resource-based approach. Thus, the “vitamin” model (Warr, 1987) associates the five work characteristics in the Hackman and Oldham (1976) model with the control and social support envisaged by Karasek and Theorell (1990) (*cf.* Kompier, 2003). First assuming a direct link between work environment and health, Warr later integrated (1994) individual characteristics moderating this relationship. In 1992, Vézina, Cousineau, Mergler, Vinet and Laurendeau published a model integrating theoretical contributions of Karasek and Theorell (1990) and Siegrist (1996) (work characteristics, mediators and moderators). It should be stressed that this model was subjected to further adjustments (Vézina, 2002). Finally, Baker, Israel and Schurman (1996) made use of the ISR research stream (French & Kahn, 1962), while integrating the moderators (control and social support) from the Karasek and Theorell (1990) model.
IV. A GENERAL CONCEPTUAL FRAMEWORK FOR MODEL CHARACTERISATION

All the surveyed models attempt to account for the impact of work environment on health, in line with the definitional framework described in the methodology. In formal terms, work environment is therefore the independent variable and health, the dependent variable. The models differ in the contents and operationalization of these two variables (Kop, Althaus, & Grosjean, 2011). But what mainly differentiates between them are the intermediate variables, which mediate or moderate (Baron & Kenny, 1986; Rascle & Irachabal, 2001) the relationships between the independent and dependent variables. This conceptual framework allows us to explain these conceptual distinctions for each surveyed model (Figure 7).

A mediator variable is one which is influenced by the independent variable and which itself influences the dependent variable. Mediation can be complete, in which case the independent variable has no impact anymore on the dependent variable, after taking into account the mediator. This is the case, for example, of the original ISR model (French & Kahn, 1962), as shown in Figure 1. Mediation can also be partial and, in this case, the independent variable continues to influence the dependent variable after mediator variable intervention. For example, in the Baker et al. (1996) model, the working conditions directly impact long-term health, even after intervention of short-term stress reactions. Whatever the case, models can integrate one or more mediator variables.

A moderator variable modifies the direction or intensity of a relationship between two other variables. A well-known example is provided by the resource-based approach (Karasek, 1979, Figure 5), where the worker’s control moderates the relationship between the occupational demands and the immediate reactions produced by these demands. The models can be characterised through the number and content of the moderator variables they integrate. However, these models also distinguish themselves by the position of the moderators in the causal chain linking the independent variable, the mediator(s) and the dependent variable. For example, in the...
PSM model (Quick, et al., 1997, Figure 6), the three categories of moderator variable (individual characteristics, social support at and outside work) moderate the impact of short-term reactions on health, but not the impact of the environment on these reactions (Hargrove, Quick, Nelson, & Quick, 2011).

IV.1. Categorisation of mediator variables

We identified three categories of mediator variables in the selected models. These refer to process mechanisms explaining the impact of work environment on health. These categories are: 1) perception of the environment 2) its evaluation 3) short-term reactions, divided into sub-categories.

The significance of perceptual processes was advanced by the ISR research stream, which stressed the fact that it is not the environment as such that impacts health, but its perception by the worker (French & Kahn, 1962, Figure 1). Evaluative processes are, for their part, central to models embodying the P-E Fit approach (Figure 2). In these models, emphasis is placed on fit, denoting subjective consistency between the environment, as perceived by the individual, and his/her characteristics, as he/she perceives them. Evaluating in this context means matching perception of one’s environment with that of one’s personal characteristics. This conceptual distinction between perceptual and evaluative processes seems clear, but it is difficult to operationalize. Let us take two items contained in questionnaires inspired by the theoretical models reviewed in this paper:

- Item 1. My tasks are often interrupted before they can be completed, requiring attention at a later time; response scale ranges from “Strongly agree” to “Strongly disagree” (Job Content Questionnaire, cf. Karasek, 1985).
- Item 2. I have many interruptions and disturbances while performing my job; response scale ranges from “Agree, and I am very distressed” to “Disagree” (Effort-Reward Imbalance Questionnaire, Siegrist et al., 2004).

Strictly speaking, Item 1 measures an individual’s perception of his/her work environment. It is not a statement of the number of interruptions made by an outside observer. In Item 2, what changes are the response terms: the label associated with the highest ranking response becomes “Agree, and I’m very distressed”. This change refers to a respondent’s evaluative process. From this angle, we consider that a worker who perceives many interruptions in his/her work, without disturbance, evaluates his/her capacities (cognitive, emotional, etc.) as fitting to the environmental demands (here interruptions). Nothing guarantees that this subtle difference between the two items is sufficient to operationalize validly the perceptual and evaluative processes referred to in the models. This question is worth our attention, but the key issue here is the conceptual distinction between perception and evaluation.
Tableau 2 – Les variables médiatrices et modératrices dans les modèles théoriques recensés.
Table 2 – Mediator and moderator variables in selected theoretical models.

<table>
<thead>
<tr>
<th>Mediator variables</th>
<th>Moderator variables</th>
</tr>
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<tbody>
<tr>
<td>Institute for Social Research</td>
<td></td>
</tr>
<tr>
<td>1. French and Caplan (1972)</td>
<td>Yes No Yes Yes No No No No</td>
</tr>
<tr>
<td>2. Ivancevich and Matteson (1980)</td>
<td>Yes No Yes Yes No No No No</td>
</tr>
<tr>
<td>3. Winnubst (1984)</td>
<td>Yes No Yes Yes No No Yes Yes</td>
</tr>
<tr>
<td>4. Kahn and Byosiere (1992)</td>
<td>Yes Yes Yes Yes No Yes Yes No No</td>
</tr>
<tr>
<td>Person-Environment Fit</td>
<td></td>
</tr>
<tr>
<td>5. Cooper and Marshall (1976)</td>
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<tr>
<td>6. Dolan and Arsenault (1980, 2009)</td>
<td>Yes No Yes Yes No Yes Yes No Yes Yes</td>
</tr>
<tr>
<td>7. Siegrist (1996)</td>
<td>Yes Yes Yes Yes No No No No No No</td>
</tr>
<tr>
<td>Job design</td>
<td></td>
</tr>
<tr>
<td>8. Smith and Sainfort (1989)</td>
<td>Yes No Yes Yes No No No No No No</td>
</tr>
<tr>
<td>9. Parker, Wall and Cordery (2001)</td>
<td>No No No Yes Yes No Yes Yes No Yes No</td>
</tr>
<tr>
<td>10. Humphrey, Nahrgang and Morgeson (2007)</td>
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</tr>
<tr>
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<td>11. Karasek (1979)</td>
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<tr>
<td>12. Demerouti, Bakker, Nachreiner and Schaufeli (2001)</td>
<td>No No Yes Yes No No No No Yes Yes</td>
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<td>Preventive Stress Management</td>
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<td>13. Quick, Quick, Nelson and Hurrell (1997)</td>
<td>No No No Yes No No No No No Yes</td>
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<td>14. Nelson and Simmons (2003); Simmons and Nelson (2007)</td>
<td>Yes Yes No Yes Yes No No No No No No</td>
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<td>Integrative models</td>
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<td>15. Warr (1987); Warr (1994)</td>
<td>No No No Yes No No Yes No No No</td>
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<td>16. Vezina, Cousineau, Mergler, Vinet and Laurendeau (1992); Vezina (2002)</td>
<td>No No Yes Yes Yes Yes Yes Yes Yes Yes</td>
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<tr>
<td>17. Baker, Israel and Schurman (1996)</td>
<td>Yes Yes Yes Yes No No Yes Yes No Yes No</td>
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Legend. Processes; Perc. = perceptual; Eval. = evaluative. Reactions; Phys. = physiological; Exp. = experiential; Beh. = behavioural; Cog. = Cognitive. Characteristics; Dem. = socio-demographic; Ind. = individual; Job = work characteristics; WSS = work social support; EOE = extra-occupational environment.
Short-term reactions embrace an essential set of mediator variables in the models we are dealing with. Depending on the case, these responses are directly provoked by the work situation and/or the mediator processes referred to above (its perception and/or evaluation). These different types of reaction are gathered into four categories: physiological (heart rate, blood pressure, etc.); experiential (or phenomenological: affects, hope, etc.); behavioural (smoking, civility, etc.); cognitive (concentration, decision-making, etc.). An obvious parallel can be established between these reactions and the notion of acute stress (Cooper, Dewe, & O’Driscoll, 2001). When reactions of the same type occur over a long period through repetition, the risk of health deterioration becomes very high (depression, cardio-vascular diseases, etc.) and this is then frequently referred to as chronic stress (Chouanière, 2006). This perspective, adopted in most models, therefore focuses on only repetition of negative valence responses. Nevertheless, we have seen that some research streams, specifically job design and PSM (Humphrey, et al., 2007; Nelson & Simmons, 2003; Parker, et al., 2001; Quick, et al., 1997) also consider positive reactions, which are health-giving in the long-term (well-being, flourishing, etc.). In the tradition of positive psychology, this new perspective has prompted numerous studies (Bakker & Derks, 2010). Table 2 displays the mediator variables used in theoretical models.

Perceptual processes are thought to intervene in just over half of the models, which is not much, after all, since the distinction between objective and perceived environment seems consensual nowadays. Absence of perception-based mediation retained by certain theorists does not necessarily mean they reject the idea. All we can say, based on the published material, is that they do not underline this process.

Evaluative processes, as we understand them here, are a specific feature of a few models. This is certainly the case in the Siegrist (1996) model, but we also find them in more recent models stemming from ISR (Kahn & Byosiere, 1992) and PSM (Nelson & Simmons, 2003; Simmons & Nelson, 2007) research streams. It may seem contradictory to observe that evaluation does not appear as a mediator in two models associated with the P-E Fit research stream (Cooper & Marshall, 1976; Dolan & Arsenault, 1980, 2009), although this process is the very basis of this stream (French, et al., 1982). This contradiction is certainly real; the authors of these two models claim their relation to the P-E Fit stream, despite the fact that evaluation does not feature clearly in the model graphical and causal description (Dolan & Arsenault, 1980, 2009) or is only referred to so vaguely that it cannot be retained as a constitutive component of the model (Cooper & Marshall, 1976).

Among the mediator variables grouped under short-term reactions, experiential responses are the most common since we find them in all models. Physiological reactions are highlighted in 12, and behavioural reactions in 10, out of the 17 models. Finally, we may be surprised by the virtual absence of cognitive responses since only one model refers to them explicitly (Parker, et al., 2001), although they are often mentioned in the literature (Chouanière, 2006; Le Blanc, De Jonge, & Schaufeli, 2000). In all, nine out of the 17 selected models include three
categories of reaction (most frequently physiological, experiential and behavioural), five only integrate two and three only consider one type of reaction.

IV.2. Categorisation of moderator variables

There are multiple diversified moderator variables in the selected models. These can be grouped in five general categories. Socio-demographic characteristics concern gender, age or level of education. Individual characteristics usually refer to not only personality traits (introversion-extraversion, neuroticism, etc.), but also more affective (self-esteem, negative affectivity, etc.), cognitive (locus of control, etc.) or behavioural (Type A, etc.) aspects. Moreover, they include resources available to the individual (initial state of health, abilities, etc.). Work characteristics can also be moderators. In terms of content, they do not differ from the work characteristics seen as independent variables but their status changes. Among work environment components, social support from colleagues and superiors represents a specific class since it features in a large number of models. Finally, extra-occupational environment forms the last category of moderators. This is most often social support outside the working sphere, but it can sometimes be satisfactions or dissatisfactions related to life outside work. Table 2 provides an overview of all the moderators implemented by the surveyed models.

Individual characteristics are most frequently introduced (12 out of 17 models) and their presence is systematic in models stemming from the ISR research stream, while they are absent in the resource-based approach. Other person-related moderators (socio-demographic) are included in only six models. All models in the ISR and P-E Fit streams integrate socio-demographic and/or individual moderators, while the trend is rare in other research streams. More than half the models (9 out of 17) integrate moderators inherent to the work environment (work social support and/or other characteristics). Occupational social support is the most frequent work characteristic; other characteristics involve only five models and almost all are directly inspired by the Karasek (1979) pioneer model. Moderators stemming from the extra-occupational environment have not been much studied (5 out of 17 models). Introduced by the original French and Kahn (1962) model, this moderator category is nevertheless only found in one ISR-related model (Winnubst, 1984). It reappears in two models belonging to the P-E Fit stream (Cooper & Marshall, 1976; Dolan & Arsenault, 1980, 2009), yet does not appear as necessary in later theoretical frameworks.

There is a great diversity among the models in the number of moderators taken into account. Two models implement no moderator at all (Humphrey, et al., 2007; Nelson & Simmons, 2003), while one includes moderator variables for five categories (Vezina, 2002; Vezina, et al., 1992). In the other models, the number of categories represented varies between one and four.
V. DISCUSSION – CONCLUSION

The meta-theoretical conceptual framework described in this paper allows us to go beyond the usual dichotomy (between interactional and transactional models) commonly used to introduce the theoretical frameworks explaining relationships between work environment, stress and health. We believe that this categorisation hardly accounts for the richness observed in the development of the most recent models reviewed here. This new conceptual framework postulates that all models can be described based on a unique structure comprising antecedents (work environment characteristics) and consequences (in health terms), the former acting on the latter through mediators, whose influence is potentially weakened or strengthened by moderators. Categorisation of the major mediator and moderator families then allows us to design an “identity card” specific to each model.

V.1. ADVANTAGES

This conceptual framework is simple both to understand and to implement. Above all, its level of generality allows a macroscopic description of all models based on a single conceptual basis. This standpoint offers many advantages. Firstly, the resulting perspective includes original comparison possibilities among the 17 surveyed models. Its general character allows foreseeing subsequent developments; it would be simple to extend this basic structure to other classes of variable or to detail categories by introducing sub-categories. In this sense, it should be viewed as a framework bearing multiple enrichment potentials. However, this standpoint is subject to limits, which we list below. In parallel, a historical study helps to better understand the genesis and development of theories in a research field blending varied disciplines. This historical perspective provides a glimpse of the context (social, political, etc.), in which the reviewed models emerged. It would therefore deserve to be completed by combining multidisciplinary skills.

Another advantage of this conceptual framework resides in its capacity to reveal the implicit aspects of certain models. For example, in the Cooper and Marshall (1976) and the Dolan and Arsenault (1980, 2009) models, the authors draw upon evaluative processes to detail the relationships between work situation and health. However, the reference to these processes is so ambiguous that we abandoned their inclusion in these models description (Table 2). Yet, we note that their authors claim to belong to the P-E Fit research stream, in which mediation by evaluation is an essential specific characteristic. This conceptual framework therefore leads to question such implicit aspects; similarly, it contributes to highlight contradictions between the historical basis claimed by some authors, on the one hand, and the content and structure of their models, on the other hand.

Ultimately, theoretical model description prompts questions and thoughts. We can firstly question the reasons for the popularity of the Karasek (1979)
and Siegrist (1996) models in the literature. A close look at these models (Table 2) fails to find an “identity card” that really distinguishes them from others. Moreover, they integrate only a small number of mediator and moderator variables compared with other models. This can be explained by their significant contribution to epidemiological research (Truchot, 2010). Studies vouch for their predictive validity in terms of health, especially mental and cardiovascular (INSERM, 2011). Although the popularity of the Karasek model can also be attributed to its recognition of the significance of work characteristics as moderators, it may be surprising to observe that this aspect has not spread further into more recent theoretical constructions.

V.2. LIMITS

As we have stated, the proposed conceptual framework has limits, again stemming from its ambitions. Firstly, the variables integrated into the theoretical models by their authors had to be gathered into categories to enable the models to be mutually positioned. For example, we observe that the individual characteristics category (moderators) combines very heterogeneous variables (personality, behavioural habits, etc.). It would therefore be necessary to survey the detailed content of each category to improve the accuracy of the conceptual framework. This type of work is in progress for work environment characteristics (Kop, et al., 2011).

Secondly, the “identity card” of each model, with which we end up, does not provide information on the respective positions of mediators and moderators in the causal chain, despite major differences between models on this point. This limit depends, here again, on the willingness to maintain a level of generality compatible with macroscopic comparison of the models. It would also be possible to integrate these additional components. Thirdly, the moderators were categorised based on their content, to the detriment of mechanism-based categorisation (perception or evaluation). The latter would have been just as relevant. For example, for Quick et al. (1997), it is the cognitive evaluation of a situation which moderates the relationship between short-term reactions and health. However, researchers rarely explain the processes involved in moderation. We therefore abandoned cross-referencing the content and process categories for moderators. Finally, the use of a general conceptual framework inevitably leads to a number of re-interpretations. This is the case of the Siegrist (1996) model, which refers to an evaluation of balance between perceived efforts and rewards. To integrate this into our conceptual framework, we treated it as if it evaluated the fit between the characteristics of the worker and those of the environment (cf. III.2). This assimilation is questionable without being outrageous, but it does allow us to describe the Siegrist model on a common basis.

Beyond the limits associated with the level of generality of the conceptual framework, we can also consider those related to the literature search methodology. First, the number of references consulted (including 250 research papers) would appear to be limited in view of the abundance of
literature on stress and OH. However, this literature mainly comprises accounts of empirical studies, which are not relevant here. To illustrate this, we can cite the collective report on measuring psychosocial risks at work (Gollac & Bodier, 2011). This report enabled around forty health risk factors to be listed by stressing their predictive relevance. This provided a document database and an overall result that are quite distinct from those of this paper, in which models are considered from a conceptual angle. This leads us to emphasise that the plausibility and empirical arguments of these models have not been addressed here; this would constitute a study that goes beyond the scope of this paper. We also wish to state that the resulting description of the 17 models (Table 2) naturally depends on our four selection criteria, which have been argued and used previously. Many models which did not meet the requirements were excluded. Therefore cannot be ruled out that a review based on other criteria would lead to a different outcome. Among the models excluded, we can cite: the process model of stress (McGrath, 1976), which targets performance but not health (criterion 1) and does not detail any work characteristics (criterion 2); the Olsson, Kandolin and Kauppinen-Toropainen (1990) model, which only involves shift work (criterion 3); the transactional model of stress (Cox & Mackay, 1981), which describes environment in terms of resources and demands, without detailing the content (criterion 2); the Fletcher (1988) model, which falls short on the Caplow (2000) usefulness requirement (criterion 4) due to a lack of theoretical argumentation.

Finally, conceptual description of models has the advantage of stressing their inconsistencies, but does not necessarily succeed in clarifying them. For example, the contradictions noted in the Cooper and Marshall (1976) or the Dolan and Arsenault (1980, 2009) models (in which evaluation is simply disposed of) could not be explained. Even without such contradictions, the framework does not consider the reasons which led researchers to exclude certain categories of variables rather than others. This limit is inherent to its purpose; it ensures model comparison on a unique basis but, it does not pretend to explain all the discrepancies it highlights. In other words, when a component is missing from a model, the conceptual framework does not explain whether this is because its promoters reckon it does not deserve to be considered, or whether it lies outside the aims assigned to the model.

It would nevertheless be helpful to clarify these implicit grounds, especially to deal with OH. From this standpoint, resorting to a theoretical model, whose choices are explained, establishes guidelines for action by consciously directing it towards certain categories of relevant variables. However, trying to clarify the authors’ motivations goes beyond the more descriptive than explanatory perspective developed in this paper. Furthermore, the publications we consulted do not help to respond to these issues. We therefore hope that the conceptual framework proposed here will encourage theorists to adopt a more explicit position in relation to the status of the variables not implemented in their models.

1. For example, if we combine the keywords “occupational health” AND “work environment” in the Psychinfo database, 3234 results are displayed.
REFERENCES


Work, stress and health: from theoretical models to a meta-model


SUMMARY

For more than fifty years, OH-related disciplines have witnessed the emergence of theoretical models explaining the impact of work environment on health. This paper provides a review of these models from a historical viewpoint. It also introduces a meta-theoretical framework enabling to characterise and compare them. Seventeen models were selected based on explicit criteria and described in accordance with the mediator and moderator variables they use, classified into categories (three for mediators and five for moderators). In short, over half the models include perceptual processes as mediators, whereas evaluative processes are more rarely included. As for moderators, individual characteristics prevail and are more frequently mobilised than those associated with work environment. The paper ends with a discussion of the limits of this conceptual framework.

Keywords: Occupational health, Occupational stress, Work environment, Theoretical models, Mediator, Moderator.