

# A Fuzzy-set Approach to Re-Exploring Work-related Stress-outcome Relationships: Implications for Research Methods, Theory and Practice

Vincent Cassar, Frank Bezzina and Stephanie Fabri

Dept. of Management, Faculty of Economics, Management and accountancy, University of Malta, MALTA

[Vincent.cassar@um.edu.mt](mailto:Vincent.cassar@um.edu.mt)

[Frank.bezzina@um.edu.mt](mailto:Frank.bezzina@um.edu.mt)

[Stephanie.fabri@um.edu.mt](mailto:Stephanie.fabri@um.edu.mt)

**Abstract:** This study employs fuzzy-set Qualitative Comparative Analysis to re-examine the more traditional correlational and regression models used to understand work stress and outcome relationships. Indeed, theoretical frameworks have been constructed underlying this premise and so have interventions assumed such principles. This study argues that the relationship between perception of stressors is not necessarily continuously linear and hence assessing non-linear but also more complex configurations becomes pivotal. While it is acknowledged that theory is important to simplify the explanation underlying the phenomenon of interest, likewise theory should also acknowledge new patterns that hide 'inside' the data and which reveal new pockets of information that explain the phenomenon better. Therefore, in line with calls for researchers to explore further new configurational patterns in the data and thus help build and refine theory, we examine potential complex associations between work-related stress and salient outcomes namely mental health, physical symptoms, presenteeism and intention to quit using fuzzy-set Qualitative Comparative Analysis instead of the more traditional correlational approach. Fuzzy-set methodology involves a number of parameters that include non-linearity but also equifinality and asymmetric associations. Responses were obtained from 509 employees who volunteered to fill in a work-related stress questionnaire as part of a wider campaign related to the management of psychosocial hazards at work and the data was subject to fuzzy-set configuration analysis between stressors and outcomes. Fuzzy-set analyses revealed that specific points of high or low levels of work stress did not necessarily concur with more common regression results but revealed interesting pattern associations between work related stress and outcomes. The results imply that by adopting traditional methods, the relations observed would be either over- or under- estimated and researchers are urged to explore new research methodological approaches such as fuzzy-set methodology in the analyses of their data that may reveal new patterns and hence better inform both theory and practice.

**Keywords:** fuzzy-set Qualitative Comparative Analysis; work-related stress; stress interventions; complexity; non-linearity; equifinality; asymmetry; evidence-based practice.

---

## 1. Introduction

The management of stress at work has been very high on the international agenda for over two decades or so (Cox, Griffith and Rial-Gonzalez, 2000; Leka, Cox and Zwetsloot, 2008; Hassard et al., 2018). A number of international bodies (e.g. the European Agency for Safety and Health at Work (EU-OHSA)) have provided very interesting insights on the most important emerging psychosocial hazards, and many opine that work stress can be better managed or prevented if properly measured. Several tools have been developed to this end and this endeavour is part of a wider framework to tackle psychosocial hazards, largely based on the risk management paradigm (Kortum, Leka and Cox, 2011). These tools offer the possibility for the development of a social dialogue that is critical in defining the best approach to work-stress evaluation, management and prevention (Zoni and Luchini, 2012). Psychosocial hazards have visible consequences on a number of salient outcomes not least employees' physical and psychological health (van Stolk, et al., 2014).

To improve practices that render workplaces less stressful and more conducive to enhanced well-being, researchers and practitioners alike need to understand the current positioning of the field in order to identify gaps in knowledge on the subject, as well as to identify areas that require more focus (Kortum, Leka and Cox, 2011; Cassar, et al., 2020) by adopting long-term solutions and policies that are data driven.

The current study aims to reconsider specific assumptions about the phenomenon of work stress and move away from simple linear assumptions to more complex understandings. Our broad research questions are therefore two: Does work related stress relate with outcomes in non-continuous ways? If so, what do such configurations tell us new about the phenomenon of stress at work? In line with the call of a number of other

scholars (e.g. Furnari, et al., 2021) we aim to sensitize management and organizational scholars to develop a sense of configurational theorizing which aims, besides other things, to look at the whole and the interdependence between constructs besides their relationships (Bacharach, 1989). We thus try and demonstrate that enhanced ways of analyses can shift assumed understandings and provide new avenues for better management practices (Cohen, 2007). We argue that this requires a degree of theoretical malleability when allowing ourselves to examine 'established' relations from a novel methodological and analytical perspective which may ultimately imply certain changed practices and interventions. For this purpose, we illustrate the potential use of fuzzy-set Qualitative Comparative Analysis (fQCA) as a specific technique using work stress-outcome relationships as an example. It is hoped that researchers come to appreciate the value of such research tools in a wider variety of business research phenomena. The rest of the review first presents a rationale for the need to approach theory and research from a critical stance in informing management practice and then we apply this rationale to the subject of work-related stress by employing fuzzy-set logic as a means to reconceptualise stress-outcome relations rather than the more typical 'linear'-based approach using correlational analyses.

## **2. Research as reinforcing mortar between theory and practice**

There is a fine interplay between theory, research and practice with theoretical developments evolving through the re-evaluation of data through new research paradigms (Kipping and Usdiken, 2014) which then finds itself into the 'real world' as *recommendable* practices. This process is a very lengthy one because very often, these new insights, derived from more innovative research positions, are not easily accepted in the academic community. As Grey (2004, p. 178) rightly states in the case of new critical thought in management education, this may often spur "alternatives which may initially seem as outrageous as they are unfamiliar". Likewise, Birkinshaw, et al., (2014) recommend that the future of management science and organizational behaviour is to include more intriguing questions compared to the conventional attitude in management research by primarily engaging in modes of research that are both intellectually challenging and have the potential of making an impact on practice. Indeed, theory built on sound research principles translates into more effective practice. This is not a new calling though and a number of scholars have appealed for research and practice to get closer (Cohen, 2007; Latham, 2007; Rousseau, 2007; Corley and Gioia, 2011). One implication of this union would be to re-think some of the more established 'givens' in any field of business study. It implies that it may require a stronger dialogue between the interested parties and a re-evaluation of the methods for doing research, providing explanations and applying solutions (see e.g. Billig, 2013). One benefit of this is that it may prevent 'established' theories and research from mimicking each other by reconsidering the more reductionist and perhaps simplistic ways to conceive phenomena resulting in less-than-precise models. In this, the paradox is that theories may lose some of their simplicity which is what they are set to do in the first place. In fact, it would encourage departing from primarily reductionist paradigms as these rely on an underlying understanding that finding and isolating all the parts will lead to the total or sum of knowledge about a phenomenon providing predictions and replicable interventions (Bloch, 2005).

One clarification is warranted though. We must not throw the baby out with the bathwater and discard established lines of thought that have formed and moulded a specific body of knowledge, including work stress; indeed, this method of doing science has resulted in many important discoveries (Bloch, 2005). Rather it is to take a different path and use new and interesting research methodological approaches to 'build theory' besides to 'test theory' (Colquitt and Zapata-Phelan, 2007). It also means that researchers view phenomena from more complex lenses determined by non-linear dynamics to get a more precise representation of the unfolding process underlying a phenomenon. This in turn provides more reliable interventions and more insightful implications for practice. In this regard we may position or view our mode of thinking, including in the current investigation which we present as an example, as somewhere between *qualifiers* and *builders* (Colquitt and Zapata-Phelan, 2007). Thus, research strategies require a departure from the notion of finding something or nothing to ameliorate theoretical refinement (Edwards, 2010), precision, and boundaries (Edwards and Berry, 2010). The downside to presenting such a stand is of course that established theoretical frameworks are not always adequate to provide solid explanatory backdrops for complex relations because as noted by Furnari, et al., (2021), complex explanations require theories to account for simultaneous interdependencies and generally theories aim for simplicity to, ironically, avoid complexity. Hence, such perspectives may often be binned simply because they do not 'comply' with the notions of traditionally 'good theory' (Bacharach, 1989). Moreover, reinforcing this conventional position is the fact that methodological approaches and many of the adopted

techniques consider a strong direct-effect assumption thus reinforcing the shape of the theoretical phenomenon of interest.

### 3. The case for work stress research

Stress at work is a very well researched phenomenon, rich in research, abundant in theories and with important contributions to practice. D'Amato and Zijlstra (2003) reviewed a 10-year period of research relating occupational stress to mental health, whereas Väänänen, Murray, and Kuokkanen (2014) linked the occupational health debate to the broader historical and cultural processes that took place in organizations over a 50-year period since 1960. More recently, Cassar, et al., (2020) attempted to capture work stress research by exploring the way the field has developed in terms of its key theoretical and conceptual emphases throughout the last two decades. Such a bird's eye view fosters closer discussions on areas that may be neglected and yet are of relevance to research for practical reasons. Moreover, the field has been well covered through its many meta-analyses, which are theme-specific by virtue of their scope to test hypothesized relationships. The theme-focused meta-analyses have expectedly focused attention on specific aspects and provided a good retrospective analysis of "overall" findings and general patterns. Subjects have varied and have covered role and stress (Jackson and Schuler, 1985), gender differences (Martocchio and O'Leary, 1989), social support in stress at work (Viswesvaran, Sanchez, and Fisher, 1999), self-esteem and emotional stability (Judge and Bono, 2001), job insecurity (Sverke, Hellgren, and Näswall, 2002), job satisfaction and health (Faragher, Cass, and Cooper, 2005), work stress and Coronary Heart Diseases (CHD) (Kivimäki, et al., 2006), harassment at work (Bowling and Beehr, 2006), withdrawal behaviors (Podsakoff, LePine, and LePine, 2007), work-family conflict and satisfaction (Ford, Heinen, and Langkamer, 2007), stress management interventions (Richardson and Rothstein, 2008), and organizational constraints on employee stress (Pindek and Spector, 2016), to mention but a few. The huge majority of these investigations draw on the line that work related stressors impact outcomes and by and large conceptualise these associations within a simple theoretical frame of mind strongly emphasising a correlational-type of association and in line with the general assumptions characterising many of the theories of work stress (see Cooper, 1998) that portray primarily direct effects from stressor to outcome such as JD-R (Demerouti, et al., 2001), the challenge hindrance model (LePine, Podsakoff, and LePine, 2005) and the allostatic load model of the stress process (Ganster and Rosen, 2013).

We can comfortably argue that many of these investigations have adopted the principle of 'linearity' in line with more conventional thinking on the mechanics of work-related stress. In other words, researchers have assumed that by identifying stressors they can predict the level of strains (i.e. stress-induced outcomes) that stressors elicit. Indeed, this research agenda on work-related stress has undoubtedly generated a wealth of knowledge about the stress process and how it affects people spilling over into a number of interventions and ultimately guiding a number of established psychosocial health and safety frameworks. However, it is also known that stressful demands and outcomes are not necessarily continuously and linearly related (Frese and Zapf, 1988). Indeed, simple linear relationships are not simple at all and may mask rather more complex associations. Moreover, straightforward linear relationships are not so evident in the relationship between work-related stress and other outcomes such as performance (Edwards, Guppy and Cockerton, 2007), illness (Cohen and Manuck, 1995) and absence (Harrison and Martocchio, 1998). On the other hand, the adoption of more complex analyses has not been as common as more linearly-assuming analyses in the field of work stress (e.g. Stanton, et al., 2001). From a practical point of view, this hints at the fact that the onset of work stress may not always immediately lead to reports of ailments and that the relationship may manifest itself in a more complex and unexpected manner. Such patterns of relationships will not discard established explanatory models of work stress but may actually broaden our way of thinking between stress and outcomes and thus urge practitioners to embrace the notion that psychosocial hazards and the consequences on salient outcomes are often not as straight-forward as they may look; and this has bearing on management interventions.

### 4. Adopting a complex approach to stressor-outcome relationships through fuzzy sets

At its most basic form, complexity is characterised by non-linearity. Navarro, Rueff-Lopes and Rico (2020, p. 477) define non-linearity as the non-proportional relationship among variables and argue that "a straight-line representing relationships among variables will poorly describe their true linkages. Instead of looking for proportionality among variables, non-linear relations are characterised by threshold values, tipping points and continuous up and downs, among others". Adopting the use of non-linear analytical methods has huge advantages in the advancement of our understanding of organizational phenomena and this exploratory investigation examines these in line with recent calls (Navarro, Rueff-Lopes and Rico, 2020). However,

complexity also goes one step further and examines the instantaneous arrangements of variable pairs at points in the pattern of data. In line with configurational theorizing of phenomena (Furnari, et al., 2021), these approaches provide an understanding of when and how variables interrelate thus eliciting a more complete picture of the underlying dynamics inherent in the variables. From a practical point of view this also means that the onset of work-related stress may not always immediately lead to reports of ailments and that the relationship may manifest itself in a more complex manner thus providing more practical insights into the management of stress at work.

In this specific study we attempt to zoom further into idiosyncratic shifts in the relationship between stress and outcomes using a complex approach in the hope that this will urge researchers to adopt these methods more in their research on organizational phenomena in general and work-stress and outcomes, in particular. This is hoped to take the field to a fresh level of understanding that has by and large been examined using linear approaches. In order to explore these non-conventional patterns, we apply fsQCA (Ragin, 2000, 2008) to analyse specific configurations at different degrees (high/low) of perceived work-related stress on outcomes. In the area of work stress, fuzzy-sets have not been popular with very few exceptions (e.g. Chen, Jung and Peacock, 1994; Guedes, Goncalves and da Conceico Goncalves, 2017; Javed and Bartool, 2020) and mostly in relation to ergonomics and emotional labour. Indeed, stressor-outcome relations have been generally investigated using more traditional linear ways (e.g. regression analyses and SEM) and this is one of the first studies adopting this approach known to the authors.

#### **4.1 The principles of fuzzy sets**

Fuzzy-sets are based on three pillars: non-linearity, equifinality, and asymmetric associations. First, non-linearity here means that considering the same outcome, two variables can be positively related under one configuration, negatively related under another, or even unrelated. For example, in situations of high X, two other variables (Y, Z) can have different relations under different configurations. Second, is equifinality which means that there are different configurations associated with an outcome. Thus, there can be different combinations of the outcomes, assuming high and low levels of X. For example, one might have a combination of low A and low B associated with high C. At the same time, there could be another combination whereby high A and high D are associated with high X. And third, is asymmetric associations which means that what leads to the low presence of an outcome is not necessarily the inverse of what leads to the high presence of an outcome (Ragin, 2000, 2008). This implies that low Y could be related to high X across most of the configurations, but it does not exclude the fact that this outcome could also be related to X.

But what justifies this approach compared to other more traditional approaches? fsQCA is based on set-theoretic methodology and it is more justified where complex relations are presumed. Fuzzy sets approaches need to endorse the aspects of nonlinearity, equifinality, and asymmetric reciprocal relations. These complex relations cannot be assessed using the traditional linear approach. First, linear methods do not generally allow for the analysis of configurations, equifinality, or asymmetric relations. Some methods allow for the analysis of endogenous relations (e.g. SEM) and multiple interactions (e.g. interaction effects method) but analysing beyond two-way effects with these methods becomes increasingly difficult (Fiss, 2007, 2009, 2011). Second, set-theoretic approaches allow for inductive reasoning because data is analysed by case rather than by variable (Ragin, 2008). The methods focus on whether these conditions are necessary or complex. A necessary condition is a condition that has to be present for the outcome to be present. A sufficient condition is a condition associated with the outcome, but there may be other conditions. This kind of analysis also allows for a more detailed inductive reasoning (Fiss, 2007) approach in re-defining a more adequate explanation (Colquitt and Zapata-Phelan, 2007). Moreover, set-theoretic methods can be either based on crisp-set or fuzzy-set approaches. While the former approach simply indicates whether a variable is in or out of a set, the latter approach is more sophisticated as it indicates the extent by which the variable is *part* of the set. This is due to the fact that each case under the fuzzy-set approach has different degrees of membership. Such approaches are considered the most relevant when assessing complex relations (Campbell, Sirmon and Schijven, 2013; Fiss, 2007; Fiss, Cambre' and Marx, 2013; Schneider and Wagemann, 2012).

## **5. Method**

We examined the principles of fuzz-set logic by re-running a series of correlational analyses between work related stress and salient outcomes. In doing so, we provide an example of how looking at the patterns of data

characterising the phenomenon may prime new insights into the mechanics determining the relationship between stress and outcomes and subsequently on improved management interventions.

### 5.1 Participants and procedures

This study was part of a wider campaign aimed at promoting psychosocial wellness at work and preventing work stress. Between March and June 2019, 509 completed questionnaires were received from employees hailing from a wide spectrum of job levels who volunteered to participate. The majority of the respondents were female (51.9%), aged 25-49 (57.8%), in full-time employment (86.8%) and in possession of an indefinite work contact (70.5%).

### 5.2 Measures

**Work stress:** One tool that has received much attention in investigating stress at work is the Health and Safety Executive's Management Standards Indicator Tool (MSIT). This consists of seven psychosocial indicators, namely demands, control, support (peer and managerial), relationships, role and change. Following the 35-item version (Edwards et al., 2008), a refined version consisting of 25 items was developed (Edwards and Webster, 2012). The MSIT's 25-item measure (Edwards, et al., 2008) received some attention in terms of its internal psychometric properties (Balducci, et al., 2017). A more recent evaluation of the shorter version (Cassar, Bezzina and Buttigieg, 2020) reported that the 25-item version had convergent and discriminant validity issues. Following the removal of five items, the revised 20-item MSIT demonstrated better construct validity and was well-represented by a higher order factor namely work-related stress (WRS). The MSIT has been shown to relate with known stress-related outcomes like general mental health, reduced job performance, intention to quit and job satisfaction (Kazi and Haslam, 2013; Marcatto, et al., 2014). Overall, these studies suggest that the modified indicator is effective in assessing psychosocial factors in stress management interventions and is a reliable assessment of WRS. Higher scores reflected higher WRS. (Cronbach's alpha = .85).

**General Health:** The 12-item general health questionnaire (GHQ-12) devised by Goldberg (1978) was utilised. It comprises social dysfunction, anxiety/depression and loss of confidence and item scoring ranges from '0 = not at all' to '3 = much more than usual'. An example item is: 'I have lost much sleep over worry'. Higher scores indicate lower general health/well-being. (Cronbach's alpha = .88).

**Physical symptoms:** The Physical Symptoms Inventory by Spector and Jex (1998) was used. It assesses physical, somatic health symptoms thought by stress researchers to be associated with psychological distress. This scale comprises 18 symptoms and respondents were required to indicate whether that had any symptoms (e.g. an upset stomach) during the past 30 days on the following scale: '0 = No', '1 = Yes, but I didn't see a doctor' and '2 = Yes and I saw a doctor'. Higher scores indicate more physical symptoms. (Cronbach's alpha = .76).

**Presenteeism:** The Stanford Presenteeism Scale (Koopman, et al., 2002) was utilised. It encompasses two dimensions (completing work and avoiding distractions). Item scoring ranges from '1 = strongly disagree' to '5 = strongly agree'. An example item is: "I felt hopeless about finishing certain work tasks due to my health problem/s". In this study, higher scores are indicative of higher presenteeism (i.e. a worker's inability to concentrate and accomplish work due to health problems). (Cronbach's alpha = .70).

**Intention to leave:** The three items pertaining to this construct were taken from Cammann, et al., (1979). Respondents rated the items on a Likert scale ranging from '1=strongly disagree' to '5= strongly agree'. An example item is: 'I often think about leaving my current job'. Higher scores are indicative of a higher intention to quit the current job. (Cronbach's alpha = .89).

All variables correlated in the proper theoretical direction (Table 1).

**Table 1:** Correlations between study variables

Variable	1	2	3	4	5
1. WRS	1.00	0.23**	0.17**	0.10*	0.37**
2. General health		1.00	0.49**	0.22**	0.28**
3. Physical symptoms			1.00	0.31**	0.21**
4. Presenteeism				1.00	0.12**
5. Intention to quit job					1.00

\* $p < .05$ ; \*\* $p < .01$

### 5.3 Calibrations

One stage of analysis in fuzzy logic involves the calibration of all measures. This step involved the conversion of continuous variables to a scale which shows the strength of the variables. The scale ranged between 0 (completely out of the set) and 1 (completely in the set). The direct method of calibration is used whereby the theoretical understanding of the measures, together with the statistical distribution of each measure, are used to determine the calibrations outlined in Table 1 together with the descriptive statistics (Ragin, 2000, 2008). Before identifying the calibrations shown in Table 2, different levels of calibrations were used. That is, numerous options have been analysed (+/-5%) using variations in calibrations for each variable in order to ensure that the solutions are robust. There was no real change in the end results, meaning the model is robust.

**Table 2:** Descriptive statistics and calibrations

Variable	Statistical Distributions				Calibration		
	Max.	Mean	Min.	SD	Full-Membership	Cross-Over	Non-Membership
Work-related stress	4.35	2.35	1.20	0.55	4.30	2.30	1.20
General Health	2.83	0.96	0.00	0.51	2.00	0.95	0.00
Physical Symptoms	1.61	0.31	0.00	0.22	1.00	0.25	0.00
Presenteeism	5.00	2.56	1.00	0.73	4.00	2.50	1.00
Intention to Quit Job	5.00	2.44	1.00	1.24	5.00	2.20	1.00

### 5.4 Data analysis

The data analysis was performed using fsQCA 2.0. The data analysis involves assessing the sufficient and necessary conditions through the sufficiency analysis and necessity analysis, respectively. The former type of analysis shows different configurations that are sufficient for the outcome to occur. The latter type of analysis indicates whether a variable has to be present in order for the outcome to take place (Ragin, 2000). The outcomes for both types of analysis include high and low WRS. For both cases, the intermediate solution has been used for interpretation, as with previous studies that have adopted this approach (e.g., Moreno, Prado-Gascó, Hervás, Núñez-Pomar, and Sanz, 2016). The analysis involves a total of 4 conditions and therefore 16 (2<sup>4</sup>) potential combinations, based on two different states, that is, high or low. The frequency threshold for the study was 10 cases per solution for both high and low outcomes, encompassing 100% of the sample, beyond the recommended 80% stipulated by Ragin (2008). In both types of analysis, in order to ensure robust results, data is examined for consistency to the proportion of cases associated with a given outcome (Ragin, 2000, 2008). Results are also examined for raw and unique coverage which “indicates how much of the membership in the outcome is covered by the membership in a single path” (Schneider and Wagemann, 2012; p. 139). Following the sufficiency analysis, the potential presence of necessary conditions is examined for both outcomes. Necessary conditions illustrate whether the condition tested has to be present for the outcome to be present (Ragin, 2000). A condition is necessary if consistency and coverage are at least 0.90 and 0.80, respectively (Ragin, 2006).

Owing to space, interested readers may find technicalities of the methods adopted in Ragin (2000).

## 6. Results

### 6.1 Necessity Conditions Results

This section will examine the necessary conditions and sufficient conditions results before presenting the associations for both high and low levels of WRS. If an outcome has a consistency and coverage of at least 0.90

and 0.80, respectively, then it implies that that specific outcome is a constant outcome for WRS. Table 3 provides a summary of the necessity conditions results.

**Table 3:** Necessity conditions analyses

Outcome Levels	High Presence of WRS		Low Presence of WRS	
	Consistency	Coverage	Consistency	Coverage
High General Mental Health	0.75	0.75	0.65	0.72
Low General Mental Health	0.72	0.65	0.77	0.78
High Physical Symptoms	0.73	0.74	0.65	0.74
Low Physical Symptoms	0.74	0.65	0.77	0.76
High Presenteeism	0.80	0.72	0.69	0.69
Low Presenteeism	0.65	0.65	0.72	0.80
High Intention to Leave	0.72	0.73	0.56	0.63
Low Intention to Leave	0.64	0.56	0.77	0.76

Based on the criteria identified in the methods section, none of the conditions can be considered to be necessary.

### 6.2 Sufficiency Conditions Results

The sufficient conditions are presented in Table 4. The table indicates bundles of outcomes that are associated with WRS. As shown in the necessity analysis, no single variable alone within the specific configurations is associated with WRS. However, as indicated in the sufficiency analysis, different bundles of outcomes are likely to be related to WRS. “●” and “⊗” illustrate the high presence and low presence of the conditions, while the blank spaces show indifference towards the outcome. We found six configurations associated with the high presence of WRS (configurations 1-6), and four configurations associated with low WRS (configurations 7-10) (Table 5). All configurations associated with high WRS share a common element, that is the high intention to leave. In configurations associated with low WRS, one can notice the absence of high intention to leave and presenteeism. The results for both high and low levels of the outcomes are explained in the sufficiency analysis below. The consistency value has been set at 0.9855 and 0.970 for the high and low outcomes, respectively, both higher than the 0.75 threshold (Ragin, 2008). Unlike consistency values, there is no particular threshold for the level of coverage and the levels of coverage are in line with studies that have adopted this method (e.g., Meuer, 2017). Overall, the solution shows clear signs of complex relations involving nonlinearity, equifinality and asymmetric relations. Nonlinearity is evident through the fact that different variables have different relations under the same outcome. Equifinality is evident through the different configurations illustrated under the two outcomes. Therefore, there are different routes associated with the two outcomes. The solution also shows asymmetric associations, when comparing the two different outcomes. This is due to the fact that configurations associated with low WRS and not the exact inverse of configurations associated with high WRS. For example, configurations 3 and 8 involve high general health and physical symptoms, yet the outcomes are different. That is configuration 3 is related to the high presence of WRS while configuration 8 is related to the low presence of WRS. These complex relations clearly show that if we had to adopt linear regression methods, the relations involved would be either over- or under estimated. These complex associations are further explained in the discussion section.

**Table 4:** Sufficiency conditions analyses

Permutation	High Presence of WRS						Low Presence of WRS			
	1	2	3	4	5	6	7	8	9	10
General Health	●		●		⊗	⊗		●	⊗	⊗
Physical Symptoms		⊗	●	●	⊗			●	⊗	⊗
Presenteeism	●	●		⊗		⊗	⊗		⊗	
Intention to Quit Job	●	●	●	●	●	●	⊗	⊗		⊗
Consistency	0.896	0.904	0.899	0.903	0.904	0.909	0.888	0.947	0.949	0.943
Raw Coverage	0.456	0.485	0.395	0.417	0.429	0.425	0.589	0.436	0.456	0.448
Unique Coverage	0.002	0.001	0.001	0.002	0.001	0.002	0.117	0.023	0.063	0.034
	High Presence of WRS						Low Presence of WRS			
<b>Overall Solution Consistency</b>	<b>0.855</b>						<b>0.870</b>			
<b>Overall Solution Coverage</b>	<b>0.619</b>						<b>0.731</b>			

Notes: Black circles (“●”) indicate that the presence of the condition is high, and open circles (“⊗”) indicate that the presence of the condition is low. Blank spaces indicate irrelevance of the condition to the solution.

**Table 5:** Configurations with High and Low Work-Related Stress (WRS)

WRS Presence	Configuration	Description
<b>High</b>	1	The person's high intention to leave is associated with high general health and presenteeism.
	2	The person's high intention to leave is associated with high presenteeism.
	3	The person's high intention to leave is associated with high general health and physical symptoms.
	4	The person's high intention to leave is associated with high physical symptoms.
	5	The person's high intention to leave is not associated with the other variables.
	6	The person's high intention to leave is not associated with the other variables.
<b>Low</b>	7	Low presence of variables.
	8	The person's high general health is associated with high physical symptoms.
	9	Low presence of variables.
	10	Low presence of variables.

## 7. Discussion

In line with our first research question, our case for stress-outcome relationships has shown that using fuzzy sets reveals that familiar associations between work stress and outcomes are not necessarily linear but rather configure themselves in more complex and indeed, more interesting ways (Furnari, et al., 2021). Indeed, associations between stress and outcomes should not always be assumed as linear or independently simple but rather that associations configure differently at different levels of high versus low levels of work-related stress. These stress-outcome relations are in line with previous suggestions and findings (Edwards, Guppy and Cockerton, 2007; Cohen and Manuck, 1995) and provide an opportunity to refine our theoretical affirmations about the phenomenon (Colquitta and Zapata-Phelan, 2007), possibly challenging conventional understanding on the mechanisms underlying the stress process. Researchers should strive to adopt such non-linear methodological approaches not to discard accepted and established knowledge but rather to refine and seek details that may ameliorate our understanding of the stress process (Edwards, 2010; Javed and Bartool, 2002; Navarro, Rueff-Lopes and Rico, 2020). In addition, results suggest that departing from a continuous approach means that interventions aimed at reducing debilitating outcomes are not likely to gradually and predictably deflate the impact of the undesirable effects in a consistent manner (our second research question). Indeed, the literature has been cautioning about this (Frese and Zapf, 1988) and it has been rehashed in more recent literature concerning the seemingly ineffectiveness of stress management interventions (Karanika-Murray and Biron, 2015). It is time researchers and practitioners give this heed. Our results do suggest that the stress process is in fact often inconspicuous.

While correlations (and regression models) with the selected outcomes included here were in the right theoretical direction and in line with the literature, the configurations underlying the structure of the associations were not constantly in the presumed linear pattern. Results suggest that the presence of high / low stress is characterized by equifinality (for example, different configurations related to specific outcomes) and causal asymmetry (for example the configuration leading to the presence of specific outcomes was not necessarily the inverse of those configurations related to its absence). For example, as indicated in Table 4, high versus low levels of work stress elicited different configurations with outcomes such that more distinct patterns emerged allowing a more detailed understanding of fine changes in the levels of stress patterns. These complex associations may also interplay as an influence of the other outcomes too that relate to each other in a somewhat fuzzy way. In addition to these complexities, the asymmetric associations in our study indicate that traditional theoretical interpretations could lead to over estimation or under estimation of the results given that the four outcomes associated to stress cannot be all equally related to WRS in a simple linear fashion. In other words, the impact of high WRS on outcomes is not the exact inverse of the impact of low WRS on that outcome. For example, high WRS is likely to be associated with high intention to leave or low levels of general mental health. Moreover, as Table 5 clearly demonstrates, high versus low levels of stress induced different configuration patterns between the outcomes themselves. This is a clean departure from our general assumptions that 'all' outcomes correlate in the same direction at all points along the continuum. Upon looking closer, the configurational analysis shows that in situations of high WRS, poor general mental health is associated with high intention to leave, while in situations of low WRS, poor general mental health is present but associated with low physical symptoms accompanied by either low presenteeism or low intention to leave. This is not at all

times though as configurations 7, 9 and 10 indicate warranting revisits to established theoretical models of WRS and outcomes and indicating that the relationship structures are slightly more complex than usually thought to be the case. The theoretical underpinnings of these findings are twofold: First, work stress-outcome relations may vary across points in the sample suggesting that participants residing in the different configurations may relate differently to different bundles of outcomes. Second, our understanding of the stress process may require us to examine further the mechanisms that generate these more granular configurations such as personality traits and other mediators.

As highlighted in section 2, these findings also have spill over implications on practice too and adopting improved or more sensitive methodological approaches refines the bridge between theory and practice (Corley and Gioia, 2011). In essence, practitioners adopting typical diagnostic tools to evaluate the impact of work stress on specific outcomes ought to keep in mind that in adopting policies and practices to reduce the impact of stressful hazards, they should equally appreciate that interventions may operate in specific ways and at specific levels and may require a combination of interventions to maintain the low level impact of specific factors on the combined effect of outcomes. For instance, improving quality services provided by Employee Assistance Programmes in high stressful circumstances may require more focus on retaining employees but in low stressful situations focus may turn on sustaining mental health. The general understanding has been that only under conditions of high stress is retention and mental health low. Fuzzy-sets approaches challenge this position. Indeed, most interventions are often a blanket-cover approach (e.g. introducing aspects in job redesign in particular work tasks) that may not be seemingly sustainable. Therefore, policy and interventions should account for this complexity. In addition, practitioners should begin analysing stress data they obtain from their respective organizations by looking at potentially more non-linear associations and assess their internal configurational patterns. This may serve to enable their future actions to generate more impactful results as they take more informed decisions.

Of course, like all studies, no investigation is without its share of limitations. In our case, the outcome variables used are not exhaustive and hence more complex pattern associations with other outcomes could be tested in future research. However, the issues raised in the stress literature and our initial results do elicit an informed confidence that a similar pattern is plausible. This should trigger a motivation to expand our mental repertoire on the mechanics underlying the stress process. Secondly, this was a cross-sectional investigation and we may find that the patterns of associations between stress and outcomes may be even more different if explored over time.

## 8. Conclusion

This study, using work stress-outcome relationships as an example, has demonstrated the exciting avenues presented by fsQCA. Such techniques offer a new window for researchers to explore known phenomena from a fresh perspective adding to knowledge both in terms of explanation (theory) and applications (practice). While more traditional correlational approaches should provide us with a general pattern of the relationships between variables we argue that deepening our understanding requires looking at that pattern with a more detailed eye especially if we are to attain theoretical precision and practical validity. Fuzzy-sets approaches can help us in this direction. Indeed, researchers are encouraged to deepen their knowledge about such techniques in their quest to understand finer intricacies of business research phenomena as is the case of stress at work.

## References

- Bacharach, S.B., 1989. Organizational theories: some criteria for evaluation. *Academy of management review*, 14(4), pp. 496-515.
- Balducci, C., Romeo, L., Brondino, M., Lazzarini, G., Benedetti, F., Toderi, S., ... Pasini, M., 2017. The validity of the short UK health and safety executive stress indicator tool for the assessment of the psychosocial work environment in Italy. *European Journal of Psychological Assessment*, 33(3), pp. 149-157.
- Billig, M., 2013. *Learn to Write Badly: how to Succeed in the Social Sciences*. Cambridge, UK: Cambridge University Press.
- Birkinshaw, J., Healey, M.P., Suddaby, R. and Weber, K., 2014. Debating the future of management research. *Journal of Management Studies*, 51(1), pp. 38-55.
- Bloch, D.P., 2005. Complexity, chaos, and nonlinear dynamics: a new perspective on career development theory. *The career development quarterly*, 53(3), pp. 194-207.
- Bowling, N. A. and Beehr, T. A., 2006. Workplace harassment from the victim's perspective: a theoretical model and meta-analysis. *Journal of Applied Psychology*, 91, pp. 998-1012.
- Cammann, C., Fichman, M., Jenkins, D. and Klesh, J., 1979. The Michigan Organizational Assessment Questionnaire. Unpublished manuscript, University of Michigan, Ann Arbor.

- Campbell, J. T., Sirmon, D. and Schijven, M., 2013. *The good, the bad, and the fuzzy: a configurational approach to acquisitions*. Paper presented at the seventy-third annual meeting of the Academy of Management, Orlando, FL.
- Cassar, V., Bezzina, F. and Buttigieg, S., 2020. Investigating the psychometric properties and assessment capabilities of the short version of the Health and Safety Executive's Management Standards Indicator Tool. *The International Journal of Human Resource Management*, 31(16), pp.2115-2140.
- Cassar, V., Bezzina, F., Fabri, S. and Buttigieg, S.C., 2020. Work stress in the 21st century: a bibliometric scan of the first 2 decades of research in this millennium. *The Psychologist-Manager Journal*, 23(2), pp. 47-75
- Chen, J.-G., Jung, H. S., & Peacock, B. J., 1994. A fuzzy sets modelling approach for ergonomic workload stress analysis. *International Journal of Industrial Ergonomics*, 13(3), pp. 189-216.
- Cohen, D.J., 2007. The very separate worlds of academic and practitioner publications in human resource management: reasons for the divide and concrete solutions for bridging the gap. *Academy of Management Journal*, 50(5), pp. 1013-1019.
- Cohen, S. and Manuck, S. B. 1995. Stress, reactivity and disease. *Psychosomatic Medicine*, 57, pp. 423-426.
- Colquitt, J.A. and Zapata-Phelan, C.P., 2007. Trends in theory building and theory testing: A five-decade study of the Academy of Management Journal. *Academy of management journal*, 50(6), pp. 1281-1303.
- Cooper, C.L. ed., 1998. *Theories of organizational stress*. Oxford: Oxford University Press.
- Corley, K.G. and Gioia, D.A., 2011. Building theory about theory building: what constitutes a theoretical contribution?. *Academy of management review*, 36(1), pp. 12-32.
- Cox, T., Griffiths, A. and Rial-Gonzalez, E., 2000. Work-related stress. *Office for Official Publications of the European Communities, Luxembourg*.
- D'Amato, A. and Zijlstra, F. R. H., 2003. *Occupational stress: A review of the literature relating to mental health. Stress Impact Surrey*. Guildford, United Kingdom: University of Surrey.
- Demerouti, E., Bakker, A. B., Nachreiner, F. and Schaufeli, W. B., 2001. The job demands-resourcesmodel of burnout. *Journal of Applied Psychology*, 86, pp. 499-512.
- Edwards, J.R., 2010. Reconsidering theoretical progress in organizational and management research. *Organizational Research Methods*, 13(4), pp. 615-619.
- Edwards, J.R. and Berry, J.W., 2010. The presence of something or the absence of nothing: Increasing theoretical precision in management research. *Organizational Research Methods*, 13(4), pp. 668-689.
- Edwards, J. and Webster, S., 2012. Psychosocial risk assessment: Measurement invariance of the UK Health and Safety Executive's Management Standards Indicator Tool across public and private sector organizations. *Work & Stress*, 26, pp. 130-142.
- Edwards, J.A., Guppy, A. and Cockerton, T., 2007. A longitudinal study exploring the relationships between occupational stressors, non-work stressors, and work performance. *Work & Stress*, 21(2), pp .99-116.
- Edwards, J., Webster, S., Van Laar, D. and Easton, S., 2008. Psychometric analysis of the UK Health and Safety Executive's Management Standards work-related stress Indicator Tool. *Work & Stress*, 22, pp.96-107.
- Faragher, E. B., Cass, M. and Cooper, C. L., 2005. The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine*, 62, pp. 105-112.
- Fiss, P. C., 2007. A set-theoretic approach to organizational configurations. *Academy of Management Review*, 32(4), pp.1180-1198.
- Fiss, P. C., 2009. Case studies and the configurational analysis of organizational phenomena. In: C. R. Charles & D. Byrne, eds. 2009. *The Handbook of Case Study Methods*. London, U.K.: Sage. pp.424-440.
- Fiss, P. C., 2011. Building better causal theories: a fuzzy set approach to typologies in organization research. *Academy of Management Journal*, 54(2), pp. 393-420.
- Fiss, P. C., Cambré, B. and Marx, A., 2013. *Configurational Theory and Methods in Organizational Research*. Bingley, U.K.: Emerald Group Publishing.
- Ford, M. T., Heinen, B. A. and Langkamer, K. L., 2007. Work and family satisfaction and conflict: a meta-analysis of cross-domain relations. *Journal of Applied Psychology*, 92, pp. 57-80.
- Furnari, S., Crilly, D., Misangyi, V.F., Greckhamer, T., Fiss, P.C. and Aguilera, R., 2021. Capturing causal complexity: heuristics for configurational theorizing. *Academy of Management Review*, 46(4), pp. 778-799.
- Ganster, D. C. and Rosen, C. C., 2013. Work stress and employee health: a multidisciplinary review. *Journal of Management*, 39, pp.1085-1122.
- Goldberg, D., 1978. *Manual of the GHQ*. Windsor: NFER-Nelson.
- Grey, C., 2004. Reinventing business schools: the contribution of critical management education. *Academy of Management Learning & Education*, 3(2), pp. 178-186.
- Guedes, M. J., Gonçalves, H. M. and da Conceição Gonçalves, V., 2017. Stress at the top: myth or fact? causal explanations from a fuzzy-set qualitative comparative analysis (fsQCA). *Quality & Quantity*, 51(5), pp. 2001-2017.
- Hassard, J., Teoh, K.R., Visockaite, G., Dewe, P. and Cox, T., 2018. The cost of work-related stress to society: A systematic review. *Journal of occupational health psychology*, 23(1), pp. 1-17.
- Jackson, S. E. and Schuler, R. S., 1985. A meta-analysis and conceptual critique of research on role ambiguity and role conflict in work settings. *Organizational Behavior and Human Decision Processes*, 36, pp. 16-78.
- Javed, S., and Batool, N. (2020). Assessment of conventional and advanced methodologies: Application of configurational approach and fuzzy set theory in emotional labor research, *The Electronic Journal of Business Research Methods*, 18(2), pp.72-83, available online at [www.ejbrm.com](http://www.ejbrm.com).

- Judge, T. A. and Bono, J. E., 2001. A rose by any other name: Are self-esteem, generalized self-efficacy, neuroticism, and locus of control indicators of a common construct? In: B. W. Roberts & R. Hogan, eds. 2001. *Decade of behaviour: personality psychology in the workplace*. Washington, DC: American Psychological Association. pp. 93-118.
- Kazi, A. and Haslam, C.O., 2013. Stress management standards: a warning indicator for employee health. *Occupational Medicine*, 63(5), pp. 335-340.
- Kipping, M. and Üsdiken, B., 2014. History in organization and management theory: more than meets the eye. *Academy of Management Annals*, 8(1), pp. 535-588.
- Kivimäki, M., Virtanen, M., Elovainio, M., Kouvonen, A., Väänänen, A. and Vahtera, J., 2006. Work stress in the etiology of coronary heart disease: a meta-analysis. *Scandinavian Journal of Work, Environment and Health*, 32, pp. 431-442.
- Koopman, C., Pelletier, K.R., Murray, J.F., Sharda, C.E., Berger, M.L., Turpin, R.S., Hackleman, P., Gibson, P., Holmes, D.M. and Bendel, T., 2002. Stanford presenteeism scale: health status and employee productivity. *Journal of occupational and environmental medicine*, 44(1), pp. 14-20.
- Kortum, E., Leka, S. and Cox, T., 2011. Perceptions of psychosocial hazards, work-related stress and workplace priority risks in developing countries. *Journal of Occupational Health*, pp. 225-238.
- Latham, G.P., 2007. A speculative perspective on the transfer of behavioral science findings to the workplace: "the times they are a-changin'". *Academy of Management Journal*, 50(5), pp. 1027-1032.
- Leka, S., Cox, T. and Zwetsloot, G.I.J.M., 2008. The European framework for psychosocial risk management (PRIMA-EF). In: S. Leka and T. Cox, eds. 2008. *The European Framework for Psychosocial Risk Management: PRIMA-EF*. Brussels: EU Commission. pp. 1-16.
- Lepine, J. A., Podsakoff, N. P. and Lepine, M. A., 2005. A meta-analytic test of the challenge stressor–hindrance stressor framework: an explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal*, 48, pp. 764-775.
- Marcatto, F., Colautti, L., Filon, L., Luis, O. and Ferrante, D., 2014. The HSE management standards indicator tool: concurrent and construct validity. *Occupational Medicine*, 64(5), pp. 365-371.
- Martocchio, J. J. and O'Leary, A. M., 1989. Sex differences in occupational stress: a meta-analytic review. *Journal of Applied Psychology*, 74, pp. 495-501.
- Moreno, F.C., Prado-Gascó, V., Hervás, J.C., Núñez-Pomar, J. and Sanz, V.A., 2016. Predicting future intentions of basketball spectators using SEM and fsQCA. *Journal of Business Research*, 69(4), pp. 1396-1400.
- Meuer, J., 2017. Exploring the complementarities within high-performance work systems: a set-theoretic analysis of UK firms. *Human Resource Management*, 56(4), pp. 651-672.
- Navarro, J., Rita Rueff-Lopes, R. and Rico, R., 2020. New nonlinear and dynamic avenues for the study of work and organizational psychology: an introduction to the special issue. *European Journal of Work and Organizational Psychology*, 29(4), pp. 477-482.
- Pindek, S. and Spector, P. E., 2016. Organizational constraints: a meta-analysis of a major stressor. *Work and Stress*, 30, pp. 7-25.
- Podsakoff, N. P., LePine, J. A. and LePine, M. A., 2007. Differential challenge stressor hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: a meta-analysis. *Journal of Applied Psychology*, 92, pp. 438-454.
- Ragin, C.C., 2000. *Fuzzy-set social science*. Chicago and London: University of Chicago Press.
- Ragin, C.C., 2006. Set relations in social research: evaluating their consistency and coverage. *Political analysis*, (Summer 2006), pp. 291-310.
- Ragin, C. C., 2008. Qualitative comparative analysis using fuzzy sets (FsQCA). In: B. Rihoux and C. C. Ragin, eds. *Configurational Comparative Methods, Qualitative Comparative Analysis (QCA) and Related Techniques*. Thousand Oaks, CA: Sage. pp. 87-122.
- Richardson, K. M. and Rothstein, H. R., 2008. Effects of occupational stress management intervention programs: a meta-analysis. *Journal of Occupational Health Psychology*, 13, pp. 69-93.
- Rousseau D.M., 2007. A sticky, leveraging, and scalable strategy for high-quality connections between organizational practice and science. *Academy of Management Journal*, 50(5), pp. 1037-1042.
- Schneider, C. Q. and Wagemann, C., 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*. Cambridge, U.K.: Cambridge University Press.
- Spector, P.E. and Jex, S.M., 1998. Development of four self-report measures of job stressors and strain: interpersonal conflict at work scale, organizational constraints scale, quantitative workload inventory, and physical symptoms inventory. *Journal of occupational health psychology*, 3(4), pp. 356-367
- Stanton, J.M., Balzer, W.K., Smith, P.C., Parra, L.F. and Ironson, G., 2001. A general measure of work stress: the stress in general scale. *Educational and Psychological Measurement*, 61(5), pp. 866-888.
- Sverke, M., Hellgren, J. and Näswall, K., 2002. No security: a meta-analysis and review of job insecurity and its consequences. *Journal of Occupational Health Psychology*, 7, pp. 242-264.
- Väänänen, A., Murray, M. and Kuokkanen, A., 2014. The growth and the stagnation of work stress: publication trends and scientific representations 1960-2011. *History of the Human Sciences*, 27, pp. 116-138.
- van Stolk, C., Staetsky, L., Hassan, E. and Kim, C. W., 2014. *Management of psychosocial risks at work: An analysis of the findings of the European Survey of Enterprises on New and Emerging Risks (ESENER) European Risk: A European Risk Observatory Report*. Belgium: EU-OSHA.

- Viswesvaran, C., Sanchez, J. I. and Fisher, J., 1999. The role of social support in the process of work stress: a meta-analysis. *Journal of Vocational Behavior*, 54, pp. 314–334.
- Zoni, S., & Lucchini, R., 2012. European approaches to work-related stress: a critical review on risk evaluation. *Safety and Health at Work*, 3(1), pp. 43–49.