Forensic Psychiatry and Psychology

Stress and support in the workplace: The perspective of forensic examiners

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ABSTRACT

Research regarding stress in the workplace and its potential impact upon forensic expert decision-making and wellbeing is scarce. In this study, 41 forensic examiners were surveyed about the sources of their stress, the support they receive, and the potential influence of stress on their decisions. Stress from managers, supervisors and case backlogs were identified as significant factors that contributed to stress in the workplace. Neither the type of case nor working in high-profile cases were reported to be major sources of stress. Crime scene examiners reported feeling higher levels of stress from personal reasons and from the nature of their cases than analytical examiners. Female examiners reported feeling more stressed than male examiners from both general stressors and workplace stressors. Examiners in the 11–15 years of experience group felt more pressure as a result of circumstances at work than examiners in the 7–10 years group. The level of management support was not associated with either the feelings of general stress or stress in the workplace. Examiners varied in their perceptions of whether stress affected their judgements: 39% felt that their judgments were influenced by stress, while 22% did not and 39% were unsure.

1. Introduction

Forensic examiners operate in a high stress working environment (National Institute of Justice, 2019) where they are faced with various sources of stress (Almazrouei et al., 2020; Holt et al., 2017; Kelty & Gordon, 2015). Some workplace stress factors, such as high caseloads and backlogs, can be common across different occupations (Kelty & Gordon, 2015). Other factors, such as exposure to bloody crime scenes, working in a culture of 'zero errors' and being subject to cross-examination in court, are specific to the certain fields within forensic science (Jeanguenat & Dror, 2018).

It has been suggested that organizational culture can play a role and impact the decision making of forensic examiners (Dror, 2020; fifth source of bias in Fig. 1). Organizational factors can include a range of factors from time pressures and achieving targets (Dror, 2020) to implicit pressures on the examiners to align with the proposition of one legal side over another (Murrie et al., 2013), or to reach certain conclusions (Almazrouei et al., 2020; Ulery et al., 2017). Hence, under such pressurised working environments, the quality of judgments of forensic examiners can be influenced (where 'quality' encompasses not only the accuracy of decisions, but also the confidence levels of judgments and

the ability to document and interpret the conclusions relied upon by the investigators, judges, and other stakeholders (Almazrouei et al., 2019; Dror, 2016; Dror & Pierce, 2020).

Constructive relationships and adequate support are primary factors associated with stress (or lack thereof) among criminal justice employees in general (Cullen et al., 1985; Holt et al., 2017; Johnson et al., 2005). Forensic examiners interact and develop relationships with multiple stakeholders, some external to their workplace, such as investigators and lawyers, and some within their workplace (e.g., managers and supervisors; Almazrouei et al., 2019; Dror & Pierce, 2020). Communications between examiners and top-level management and immediate supervisors occur for various reasons, such as to manage caseload, review cases, verify conclusions or reach resolutions in disputed conclusions (Mustonen et al., 2015). These interactions can be a source of stress but can also be supportive and reduce stress. For example, it has been identified that the higher the level of perceived management and supervisory support, the lower the level of workplace stress (Holt et al., 2017).

Stress is not necessarily negative (Benson & Casey, 2013; Yerkes & Dodson, 1908) as stress, at moderate levels, is recognised to be a motivating factor (Driskell et al., 2014). However, research that assesses

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levels of support and the sources of workplace stress and their potential effects on forensic examiners' decision-making is still lacking (Jeanguenat & Dror, 2018; National Institute of Justice, 2019). Such research efforts are needed to keep pace with other professional domains, such as medicine (e.g., Arora et al., 2010; Zavala et al., 2018), terrorism (Corner & Gill, 2019) and policing (e.g., Akinola & Mendes, 2012; Cullen et al., 1985). To date in the forensic science published literature there have been very few studies that have considered organizational factors and their implications for decision making in casework across different forensic science fields and career stages (Almazrouei et al., 2020; Holt et al., 2017).

This study focuses on workplace stress, and sought to identify the perceived sources of workplace stress along with considerations of whether examiners receive support from management and whether examiners believed the stress they experienced affected their judgements. Perceived workplace stress was considered by the field of forensic science and the sex and years of experience of the examiner.

2. Method

2.1. The questionnaire

A questionnaire was designed to record the feelings experienced by forensic examiners regarding workplace stress and support, in a similar manner to previous studies addressing the perceptions of workplace stress (e.g., Burruss et al., 2018; Holt & Blevins, 2011; Holt et al., 2017). The questionnaire contained 10 questions about the sources of stress (questions 1–3, 6–10) and about support from management (questions 4 and 5). These questions required the examiners to rank their responses on a seven-point Likert-type scale.

An additional question was included that linked stress to the decision-making of forensic examiners: 'In your opinion, are your own judgements influenced by stress?' For this question, examiners could answer 'yes', 'no' or 'don't know'. This is the same question asked by Kukucka et al. (2017), but the term *cognitive bias* was replaced by *stress*. The examiners were also asked to provide demographic information about their field of expertise, sex, years of experience and whether they

were active in casework or retired.

2.2. Participants

In total, 41 forensic examiners from two forensic laboratories participated in this study. The mean years of experience for the forensic examiners was 14.4 ($SD = 8.2$; range = 2 to 31). The experience of participants was categorised in groups of comparable sizes (see Table 1). Forensic examiners reported that they worked within 11 primary fields of expertise. For the analysis by field, the reported fields were categorised into one of two broad categories: crime scene examination ($n = 11$, 27%) or analytical ($n = 19$, 46%, i.e. fields that primarily have analytical casework within the forensic laboratory, which include document examination, firearms examination, DNA, fingerprint examination and chemical criminalistics). A few ($n = 3$, 7%) forensic examiners did not report their field or reported that their primary field did not fall into any of the two broad field categories ($n = 8$, 20%), and so these examiners were not included in the analysis by field of expertise (see Table 1). Both descriptive and inferential statistics were applied to measure the reported stress and support levels. Unless otherwise clarified, the assumptions for the statistical tests used were assessed and fully met.

3. Results

3.1. Workplace stress and support

The mean response to each question addressing the feelings of stress encountered or support provided in the workplace is shown in Table 2. Fig. 2 illustrates the reported feelings of stress and the support the forensic examiners received. The widest variations were observed in the feelings respondents had in terms of management support, (questions 4 and 5), where 50% of the data were between scores 2 and 5, with additional responses ranging from the extreme low score of 1 to the extreme high score of 7.

When converting the whole data set ($n = 402$) into standardised z-scores, 13 data entries (3.2%) had absolute z-scores between 1.96 and
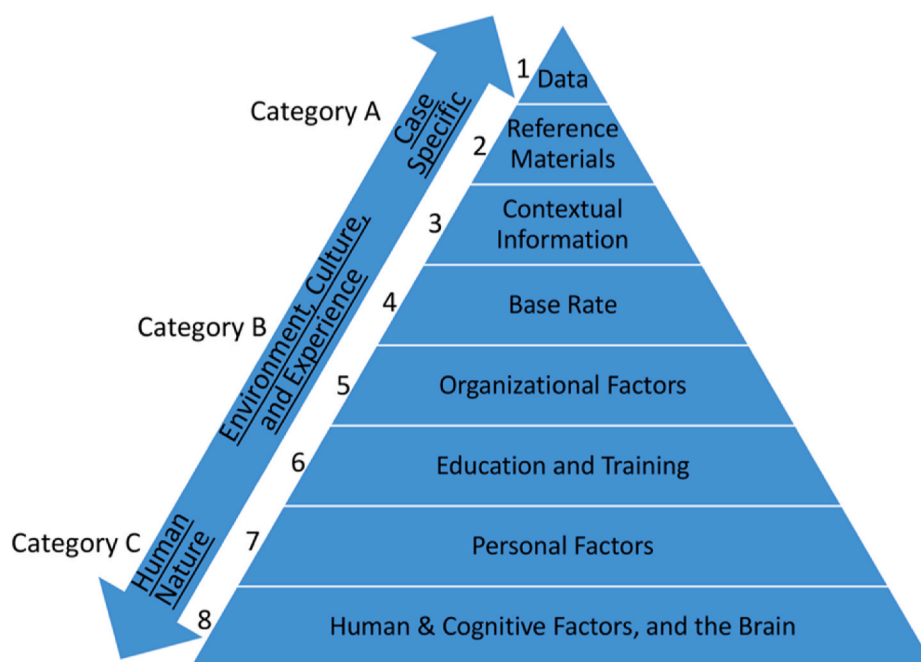

Fig. 1. Eight sources of bias that may affect expert decision-making. They are organized in a taxonomy within three categories: starting off at the top with sources relating to the specific case and analysis (Category A), moving down to sources that relate to the specific person doing the analysis (Category B), and at the very bottom sources that relate to human nature (Category C). (taken from Dror, 2020).

Table 1
Demographical information of participants.

	n	Valid%
Work Status		
Active	38	93
Retired	0	0
Did not report	3	7
Sex		
Male	18	44
Female	22	54
Did not report	1	2
Years of Experience[a]		
1–6	7	17
7–10	7	17
11–15	8	20
16-20	7	17
>20	8	20
Did not report	4	10
Field of Expertise[a]		
Crime scene examination	11	27
Document examination[b]	3	7
Firearms examination[b]	3	7
DNA[b]	4	10
Fingerprint examination[b]	8	20
Chemical criminalistics[b]	1	2
Facial recognition[c]	3	7
Forensic medicine[c]	1	2
Fire investigation[c]	2	5
Digital investigation[c]	1	2
Imaging[c]	1	2
Did not report	3	7

[a] The percentages do not add to exactly 100% due to rounding.
[b] Analytical examiners.
[c] Primary field do not fall into any of the two broad field categories.

3.29 (no absolute z-scores were above 3.29). The obtained z-score percentages were lower than the suggested cut-offs, as outlined by Field (2018; see Table 3 for details). Hence, no further statistical treatment, such as exclusion of outliers, was required (Field, 2018).

Histograms and Q-Q plots were assessed to confirm that the data were normally distributed for each of the 10 questions, which was the case for all questions except for questions 7, 8 and 9 (where the data were skewed). Hence, non-parametric tests (e.g., Mann-Whitney U) were used in the analysis of these three questions.

In a manner akin to Yoo et al. (2013), a stepwise multiple regression analysis was run to develop a model that predicted the general stress (question 1) of forensic examiners. Specifically, backward stepwise regression was chosen for this analysis because it provided a regression model with only the significant predictors (the insignificant predictors are removed from the model without having a substantial effect on how well the data fit the model) and because it is more preferable than forward regression (Field, 2018). Of all the predictors (questions 2–10), only workplace stress (question 2, $B = 0.714$, $SE_B = 0.076$, $\beta = 0.786$, $p < 0.001$) and personal stress (question 10, $B = 0.303$, $SE_B = 0.083$, $\beta =$ 0.305, $p = 0.001$) were statistically significant predictors of general stress in the model, $F(2, 37) = 54.203$, $p < 0.001$, adj. $R^2 = 0.732$ (see Fig. 3).

Given that in the first model workplace stress was a stronger predictor of general stress than stress due to personal reasons (β of 0.786 *vs.* 0.305, respectively), another series of backward stepwise regressions was run to develop a second model to predict workplace stress (thereby excluding personal reasons (question 10) and general stress (question 1) as predictors in this second model). Stress from case backlogs and the need to do many cases (question 6, $B = 0.431$, $SE_B = 0.107$, $p < 0.001$) and stress from managers or supervisors (question 3, $B = 0.407$, $SE_B =$ 0.120, $p = 0.002$) were the only significant predictors in model 2, $F(2, 35) = 21.262$, $p < 0.001$, adj. $R^2 = 0.523$. The two stress factors were of comparable strength in predicting workplace stress (i.e. β of 0.488 *vs.* 0.412, respectively; see Fig. 3).

Pearson correlations were conducted to test the relationships of management support (questions 4 and 5) with stress from the workplace (question 2) and with stress from managers or supervisors (question 3). No statistically significant relationships were found between management support and either workplace stress or stress from management/supervisors, $p > 0.05$.

3.2. Effects of field, sex and experience

Two-tailed t-tests were applied to determine if there were differences in stress and support levels between participants within each field category and between male and female examiners. The Mann-Whitney U test was used for questions 7, 8 and 9. Crime scene examiners (mean rank = 21.05) reported feeling significantly more stressed than analytical examiners (mean rank = 11.31) as a result of the nature of the cases that they were dealing with (question 7; $U = 32.50$, $z = -3.27$, $p = 0.002$, $r^2 = 0.37$). Similarly, the score for personal reasons as a reported source of stress (question 10, approaching significance; $t(30) = -1.98$, $p = 0.057$, $d = -0.75$, 95% CI[-1.84, 0.03]) was higher for crime scene examiners ($M = 3.27$, $SD = 1.27$) compared with analytical examiners ($M = 2.37$, $SD = 1.17$; see Fig. 3). The responses to the remaining questions did not significantly vary by field of expertise (i.e., all at $p > 0.05$).

Female forensic examiners reported feeling more stressed in general (question 1, $M = 4.27$, $SD = 1.08$; $t(40) = 4.26$, $p < 0.001$, $d = 1.36$, 95% CI[-0.76, 2.12]) and at the workplace (question 2, $M = 4.45$, $SD = 1.10$; $t(40) = 3.12$, $p = 0.003$, $d = 0.99$, 95% CI[0.43, 2.03]) relative to male examiners ($M = 2.83$, $SD = 1.04$ and $M = 3.22$, $SD = 1.40$, respectively). However, the sources of stress (questions 3 and 6–10) and view of management support (questions 4 and 5) did not significantly differ between female and male examiners (i.e., $p > 0.05$).

A one-way ANOVA was conducted to determine if the perceived levels of stress and support were different for the different years of experience groups. A Kruskal-Wallis H test and post hoc analysis (with the Bonferroni correction for multiple comparisons) were used for

Table 2
Means and standard deviations for the 10 questions on workplace stress and support.

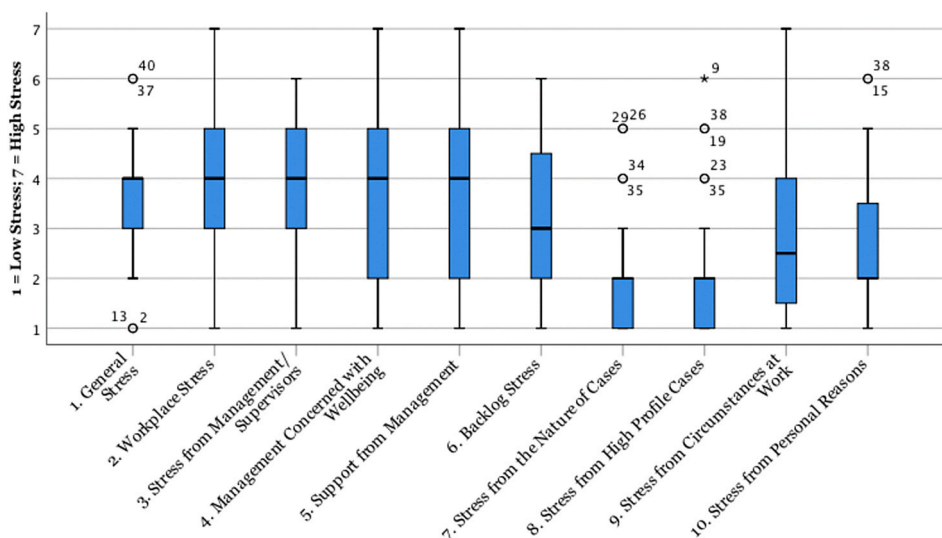| Question	M (SD)
1. How often do you feel generally stressed?	3.61 (1.26)
2. How often do you feel stressed at work?	3.85 (1.39)
3. How often do you feel stressed because of management/supervisors?	3.95 (1.47)
4. Do you feel that your management is concerned with your wellbeing?	3.85 (1.81)
5. Do you receive support from your management?	3.98 (1.86)
6. How often do you feel stressed from backlogs and the need to do many cases?	3.43 (1.55)
7. Was the source of stress related to the nature of cases (e.g., terrorism, murder, rape)?	1.87 (1.11)
8. Was the source of stress related to high-profile cases (i.e., media coverage)?	1.97 (1.31)
9. Was the source of stress related to the circumstances at your work (e.g., pressure exerted by investigators/prosecution, competition with colleagues)?	2.88 (1.70)
10. Was the source of stress related to personal reasons?	2.70 (1.29)

Fig. 2. A box plot for questions 1–10 on workplace stress and support.

Table 3
Percentages of standardised z-scores to objectively assess for outliers.

Absolute z-scores	% cut-offs (Field, 2018)	Current study (%)
Greater than 1.96	≈5%	3.2%
Greater than 2.58	≈1%	0.7%
Greater than 3.29	0%	0%

questions 7, 8 and 9. When reported stress levels varied significantly across experience groups, it was due to circumstances at work (question 9, $\chi^2(4) = 14.16$, $p = 0.007$, $\eta_H^2 = 0.32$) or personal reasons (question 10, $F(4, 32) = 2.81$, $p = 0.042$, $\eta_p^2 = 0.26$). The reported stress levels resulting from workplace circumstances were higher for 11–15 years of experience (mean rank = 29.69) than for 7–10 years of experience (mean rank = 10.14), with an adjusted $p = 0.004$. No statistically significant variations were found among the experience groups for reported stress from personal reasons ($p > 0.05$, post hoc [Bonferroni]). Univariate analysis of variance showed no significant interactions between field, sex and experience for any of the 10 questions, $p > 0.05$.

3.3. Stress and decision-making

Forensic examiners were divided on whether they thought their judgements were influenced by stress; 39% ($n = 16$) answered 'yes' to this question, while 22% ($n = 9$) answered 'no', and the rest of examiners (39%, $n = 16$) were unsure. Responses did not vary significantly by field ($p = 1.000$, Fisher's exact test), sex ($p = 0.722$, Fisher's exact test) or experience ($p = 0.517$, Fisher's exact test).

4. Discussion

4.1. Workplace stress and support

Forensic examiners reported a range of feelings of stress and views of support levels (low to high scores in all the questions; see Fig. 2). On average, examiners reported feeling a moderate level of stress in general (question 1) and at the workplace (question 2; see Table 2). Findings in the published literature have suggested that the wellbeing and performance of an individual is optimum at moderate stress levels and deteriorates at either high or low stress levels (Benson & Casey, 2013; Yerkes & Dodson, 1908). It should be noted that questions 1, 2, 3 and 6 included the term 'often' which relates to the *frequency* of stress, but the responses can also reflect the *level* of stress. Hence, it can be considered

reasonable to assume that examiners who are stressed more frequently also feel higher stress levels (Almazrouei et al., 2020; Epel et al., 2018).

Stress deriving from workplace and personal factors were significant predictors of the reported general stress of forensic examiners. The first regression model, containing these two factors alone, accounts for 73.2% of the variability in the general stress of examiners (see Fig. 3). Additionally, reported stress from the workplace was 2.5 times stronger than personal reasons as a predictor of general stress. This finding suggests the workplace environment and culture where forensic examiners operate is an important factor in the general wellbeing of forensic examiners.

Female examiners reported feeling more stressed than male examiners from both general stress and workplace stress. Previous research reported women can experience higher stress levels than men at the workplace for reasons such as having additional family responsibilities outside the workplace (Sharma et al., 2016) and differences in coping styles (Matud, 2004). However, the data of this current study did not identify the specific sources of stress that influence female examiners differently to male examiners (i.e., $p > 0.05$ for questions 3, 6–10). Therefore, future research could usefully investigate the variability of causes of perceived stress.

Given the importance of understanding the contributing factors to workplace stress, a second regression was run. Model 2 identified management and case backlog as factors that were significant predictors of perceived stress, accounting for 52.3% of the variability of perceived workplace stress. These two factors were also found to contribute more to the *high* stress levels felt by forensic examiners than personal reasons (Almazrouei et al., 2020). This is unsurprising given that stress caused by managers/supervisors and case backlogs are common organizational-level sources of stress that are documented in other domains outside forensic science (Cooper & Marshall, 1976; Jeanguenat & Dror, 2018).

Stress that arises from outside the work environment, such as from personal reasons, can affect performance at the workplace and vice versa (Bell et al., 2012; Sok et al., 2014). In this study, perceived stress as a result of personal factors (such as financial and family issues) was a significant predictor of feelings of general stress, and crime scene examiners reported higher stress levels from personal reasons (albeit, approaching significance) compared with analytical examiners (see Fig. 3). Previous research found that shift work was a major source of stress to crime scene examiners, as it impacts their inability to make plans and keep commitments in their personal life (Kelty & Gordon, 2015). In addition, stress from personal reasons varied with years of
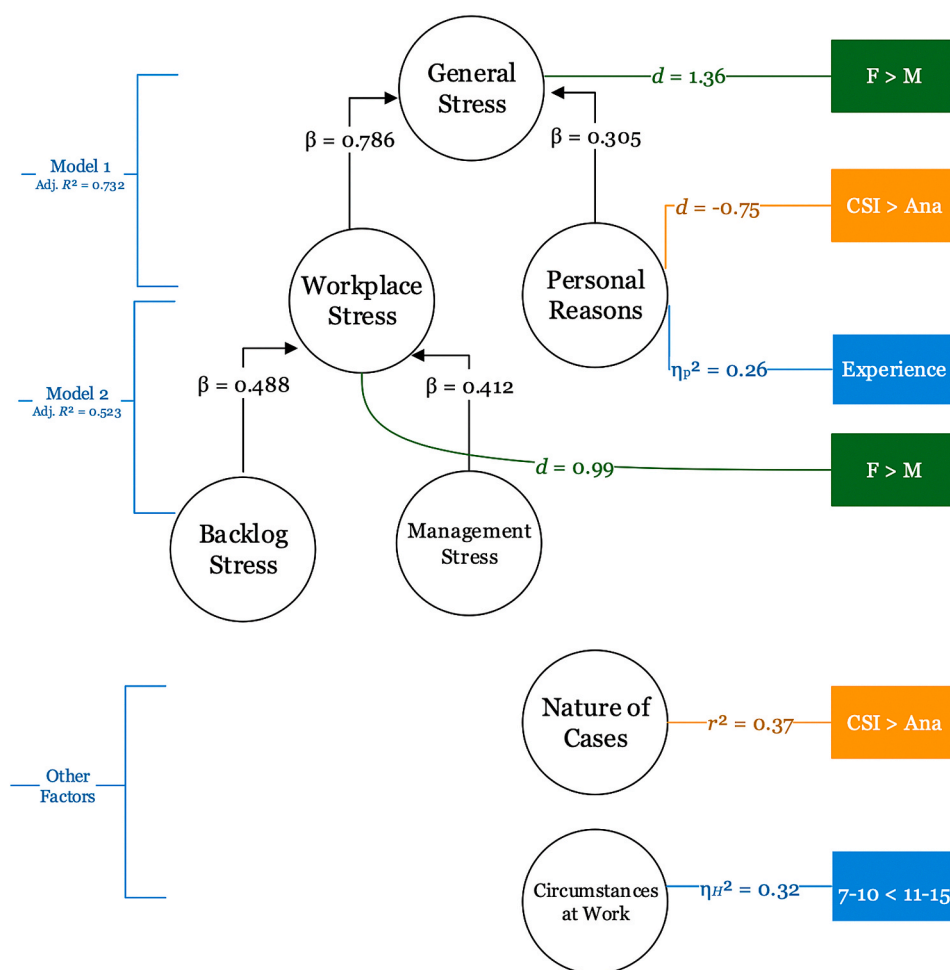
Fig. 3. A summary of the results showing the significant findings at an alpha level of 0.05. Regression models 1 and 2 (Adjusted R^2; standardised β); stress by field of expertise (orange box; CSI = crime scene investigation field; Ana = analytical field; Cohen's d; Mann-Whitney U r^2); stress by sex (green box; F = female; M = male); and stress by experience (light blue box; one-way ANOVA η_p^2; Kruskal-Willis H η_H^2). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

experience; however, it should be emphasised that the number of years of experience that a forensic examiner has can also be correlated to age (e.g., Patterson, 2003), which also correlates to other variables. Hence, it is not possible to attribute the findings to experience *per se* as it may be due to a correlation to other factors rather than causation.

Neither the nature of cases nor working in high-profile cases were reported to be major sources of stress (see low mean scores in questions 7 and 8, Table 2). Field-specific differences were found in reported levels of stress from the nature of cases, such as working at murder scenes, where crime scene examiners felt more stressed than analytical examiners. Typically, analytical examiners are not exposed to stress elements from a crime scene, such as bloody scenes (Jeanguenat & Dror, 2018) or stress from managing critical decisions at a crime scene under time pressure (Helsloot & Groenendaal, 2011). These differences in work environment and tasks may provide insights into why crime scene examiners reported feeling more stressed than analytical examiners working on the same type of case.

Similarly, stress from circumstances at work, such as feeling pressure from investigators or prosecutors or enduring competition from colleagues, was relatively low (question 9, Table 2). Post hoc analysis revealed differences between the years of experience groups. Examiners in the 11–15 years of experience group felt more pressure as a result of circumstances at work than examiners in the 7–10 years of experience groups. This may be a result of the differences in roles and responsibilities for examiners who have more experience, or related to other correlated factors, such as age (see above).

Relationships in the workplace, including managerial and supervisory support, can be important factors related with stress (Cullen et al., 1985; Holt et al., 2017; Johnson et al., 2005). In this study, on average,

forensic examiners reported feeling that their management was moderately concerned with their wellbeing and that they received moderate support from management (see Table 2). Management support (questions 4 and 5) was not a significant predictor of either the general stress (question 1) or workplace stress (question 2) reported by forensic examiners. Also, the correlation between the findings from these four questions were insignificant. In contrast, a previously published study found management and supervisory support were significant predictors of reduced stress and increased job satisfaction (Holt et al., 2017). The different findings may be due to different working environments in different laboratories.

4.2. Stress and decision-making

Examiners were divided as to whether stress affected their judgments. Some forensic examiners (39%) felt that stress affected their judgements. To enable clear and transparent forensic science judgments, it has been argued that having a decision-making environment that manages the risks of stress (National Institute of Justice, 2019) and uncertainties (Georgiou et al., 2020; Morgan et al., 2018; see also Dror and Pierce (2020) for quality control and risk management) is important. However, the findings from this study are derived from self-reporting responses, and such responses are outputs of highly complex cognitive information and processing (Gardner et al., 2019; Nisbett & Wilson, 1977). A perception that stress may have influenced a judgement does not necessarily mean the decisions and conclusions made have been influenced by a single stressor or combination of stressors (Almazrouei et al., 2020).

It is worthy of note that extensive empirical research from other

domains indicates that stress influences expert decision-making.

(e.g., Akinola & Mendes, 2012; Arora et al., 2010; Yu et al., 2015). However, in this study, some examiners in the forensic services domain (22%) said that stress did not bias their own judgements. Different explanations may exist for this finding. It could mean examiners do not think their judgements are influenced at all — with or without stress. Such a bias blind spot has been identified when an expert does not believe context (including bias from stress) affects their *own* decision-making and conclusions, but that it can affect others (Kukucka et al., 2017; Page et al., 2012). Alternatively, this finding could indicate that stress does not affect the decisions of examiners perhaps due to examiners being more attentive when stressed. This would be a fruitful area for further research that addresses the multivariate complexity of the impact of stress on decisions within crime reconstructions.

The findings of this study provide insights into the sources of stress for forensic examiners, their feelings on the support they receive in the workplace, and their perceptions of whether stress affects their judgements. However, it is important to consider the findings in this study with caution, due to limited statistical power from the relatively small sample size of forensic examiners. In addition, it is important to note that this study includes data from more than one laboratory which may have potentially introduced confounding factors. This is because each has its own working culture and work practices (such as case backlogs and managerial support), and also due to the variations in the demographics of expert participants recruited from each lab.

5. Conclusion

This study surveyed forensic examiners working in different fields of forensic expertise and with different years of experience on their feelings of stress and support in the workplace. On average, examiners reported feeling moderate stress levels. Workplace and personal stress factors were significant predictors of *general stress*. Stress from management and/or supervisors and case backlogs were significant predictors of *workplace stress*. Management support was not a significant predictor and was not associated with either general stress or workplace stress.

Feelings of stress as a result of the type of case, from working in high-profile cases, and from circumstances at work (such as enduring pressure by investigators or prosecutors) was relatively low (mean scores of these stress factors were below 3 (out of 7)).

Crime scene examiners reported feeling higher stress than analytical examiners from personal reasons and from the nature of cases they were involved with. Male examiners reported feeling less stressed than female examiners from both general stressors and workplace stressors. Examiners within the 7–10 years of experience group reported feeling less stress due to circumstances at work than those within the 11–15 years of experience group at work.

Examiners were divided by their opinion on whether stress affected their judgements. There are different plausible explanations for this but it is clear that the impact of stress on forensic science judgements should be explored in future research on the experiences of forensic examiners as well as objective experimental research.

Going forward, gaining a greater understanding of the positive and negative impacts of stress, and the feelings examiners experience of stress in the work place will be highly valuable for the development of a working culture that addresses the negative impacts of stress on forensic science examiners and their judgements.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Itiel Dror is an Editorial Board Member of FSI Mind and Law and has no access to the peer review of this manuscript.

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