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A Scoping Review of Stress Measurements and Psychometry in Police Research

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Abstract
Despite a growing body of research, there is no systematic body of evidence that establishes the rigour of existing measures of stress among police. The aim of this scoping review was to investigate (1) the diversity of stress measures used in police research and (2) the psychometric properties of such measures and the ways in which they are utilised. The systematic literature search discovered 16,216 records, which were reduced to 442 records of relevance. A total of 20 qualitative and 422 quantitative studies were found to be relevant, including a total of 129 unique measures, of which the majority showed satisfactory reliability (Cronbach's alpha ≥ 0.80). The identified measures pertain to four main categories: police-specific, perceived stress, psychological and physiological outcomes (including mood and affect changes), and assessment batteries. The measures have a general tendency to emphasise illness, and police-specific stressors pertain mostly to traditional police work. Measures should be chosen based on the aspect of the stress phenomenon that is to be investigated. This study provides detailed recommendations concerning how to use these measures to advance research concerning stress among police.

Keywords Stress · Police · Law enforcement · Scoping review · Stress measurement · Psychometric properties

Stress is ubiquitous in modern society, and few areas in contemporary psychology receive more attention (Hobfoll 1989; Robinson 2018; van Woerkom et al. 2021). The strong association between work-related stress and reduced wellbeing is well documented (Beehr and Newman 1978; Brown and Campbell 1994; Dewe and Cooper 2017; Johnson et al. 2005; Spielberger and Reheiser 1994). Working in the police service, either as a police officer (Abdollahi 2002; Brown and Campbell 1994; Purba and Demou 2019; Violanti et al. 2017) or as a civilian (Alderden and Skogan 2014; Ermasova et al. 2020), is no exception to this rule. The prevalence of stress-related problems is higher among employees in the police service than among members of the general public (Morash et al. 2006; Slate et al. 2007; Violanti et al. 2013a, b). The recognition that policing is a hazardous and stressful profession has stimulated a variety of studies focusing on the relationship between stress and pathology, which have been conducted with varying research designs and measurement methods (Abdollahi 2002; Queriós et al. 2020; Webster 2014).

Police work affects society and citizens as a whole (Cockcroft 2020; Symonds 1972; Wilson 1978) either with an emphasis on law enforcement or service provision. Many tasks performed by police are incident-driven, whether they are performed by a patrol unit, an investigation division, or by the administration. The tasks are also visible, often time limited, and have no simple consensus or known solution (Anshel et al. 1997; Hansson et al. 2017). Each case and situation must be addressed in accordance with the individuals and context involved (Hesketh and Cooper 2017) either by using analytical considerations or intuitively. Irrespective of policy and practice, any use of force must be necessary, proportionate, and in accordance with human rights and equalities legislation.

Stress responses affect cognitive and motor skills, e.g., physiological requirements needed for urgent situations (Anderson et al. 2019; Anshel et al. 1997; Regehr and LeBlanc 2017; Yaribeygi et al. 2017). Employees lacking the ability to cope may pose a threat to themselves, colleagues, and the public (Saunders et al. 2019; Webb

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and Smith 1980) and may impair the performance of law enforcement (Bitner 2019; Shane 2020). Hence, police work and the ways in which working conditions, stress, and strain influence different facets of policing have received considerable academic attention since the early 1970s (Stratton 1978). However, a systematic overview of the rigour and properties of existing measures of stress among police is missing. This scoping review fills this gap.

Stress as a Phenomenon

A common way to understand psychological stress is through the transactional model (Lazarus 1995), according to which cognition and subsequent emotions are important considerations in behavioural response to a stimulus (Robinson 2018). Despite disagreements concerning conceptual issues and definitions in stress research, there seems to be a consensus on the importance of individual differences in responses to stressors (Anshel et al. 1997). The transactional model "highlights the cognitive process of appraisal as a mediator when confronted with a stressor" (Robinson 2018, p. 8).

Understanding personal involvement and the particular context is crucial to ameliorate or prevent stress at the workplace (Lazarus 1995). Once the appraisal process begins, the degree to which an individual considers a situation to be a source of stress depends on the subjectively perceived balance among environmental demands, contextual constraints, and resources, as well as individual coping abilities (Adams and Mastracci 2020; Dewe 1991; Lazarus 1995; McEwen 2012; Shane 2020). The appraisal process integrates two sets of forces in this context, namely, the individual's agenda and the environmental realities affecting the outcome (Lazarus 1995). Primary appraisals refer to whether the individual has a personal stake in the encounter. Secondary appraisals concern coping options based on available social and organisational resources and the amount of control that individuals feel they have over the situation. The appraisal processes and subsequent reappraisals are governed by the cumulative sum of contextual, situational, or private disturbances (Evans and Coman 1993; Gächter et al. 2011) and are a function of demands, available internal or external resources, and support (Rodrigues et al. 2019). Thus, the same situation or difficulty may be interpreted as harmless by one individual and as stressful by another (McEwen and Sapolsky 1995; Yaribeygi et al. 2017). This fact implies that situations, chronic working conditions, and daily hassles, whether acute or not, become stressful when appraised as such and not simply because they occur (Anshel 2000; Gudjonsson and Adlam 1985).

Untreated levels of stress, accompanied by loss of control and composure, cause impaired perception, memory, decision-making, reaction, and work performance (Arble et al. 2019; Gutshall et al. 2017; Larsson et al. 1988; McEwen and Sapolsky 1995; Regehr and LeBlanc 2017; Shane 2020). On the other hand, mastery of stressful situations entails positive beliefs and emotions (Anshel et al. 1997; Faragher et al. 2004) and fosters concentration, skills, performance, and eagerness (Anshel et al. 1997; Nisar and Rasheed 2020; Noblet et al. 2012).

Stress in the Police Context and How It Is Measured

The various measures used to study stress among police are based on differing underlying theoretical assumptions and elements of the stress phenomenon (Dollard et al. 2013; Slate et al. 2007; Webster 2013). The measurements assess a variety of issues, such as adverse life events, stressful environments, the individual's physiological and psychological responses, and the interaction between the individual and the environment (Bhui et al. 2016). By measuring the presence and magnitude of occupational stressors, stress responses, and mood changes among police, one seeks to understand the work challenges, demands, and requirements involved in police work. The main idea is that this investigation may help to provide safe and engaging work conditions for police and to secure citizens' legal and human rights in the communities that police serve and protect.

One way of measuring stress is to inquire into police-specific stressors such as acute or chronic stressors, daily difficulties, or events of significance to policing. Another approach is to ask respondents to rate their general perception of stress. The latter approach contributes to the understanding of general and individual factors associated with perceived stress, which are not necessarily police-specific. A third way of measuring stress is to study the prevalence of reactions and outcomes, i.e., distress and strain, such as the impact on cognitive capacity, concentration, risk taking, withdrawal, anxiety, anger, irritability, and physical capacity or ailments.

Studies aimed at identifying and evaluating the general effect of occupational stress on physical and mental health, regardless of profession, seek to provide a comprehensive characterisation of work stressors in the work environment (Hurrell et al. 1998). Theoretical models have guided the construction of various generic measurements and batteries of scales. The aim of these models is to increase knowledge concerning how to foster practices that will either reduce job stress or improve an individual's adjustment to stress. Such batteries mainly contain three types of variables: work stressors, strain, and health outcomes. While comprehensive measurements may provide a more profound understanding, briefer measurements might represent an efficient first-pass psychosocial risk assessment for the identification of areas that warrant in-depth assessment and targeted risk reduction activities.

The sources of stress in the policing profession are often divided into operational and organisational demands or stressors (Hillgren et al. 1976; Kroes 1976; Reiser 1976; Shane 2020; Symonds 1970; Violanti et al. 2017), with the latter identified as the predominant stress source (Shane 2020; Stinchcomb 2004; Violanti et al. 2017). The operational demands impinging police work comprise acute (e.g., critical on-the-spot decisions, responding to high-risk calls, high-speed pursuits, missing or nonfunctioning equipment), and chronic stressors (e.g., patrol activities, inactivity and boredom, traffic control activities, help and safety duties, and the ineffectiveness of the judicial or correctional systems). Although rarer in frequency (Berg et al. 2005; Hickman et al. 2011; Padilla 2020), traumatic events and threats to physical and psychological health are also included in the category of operational demands.

Organisational stress refers to chronic (Anshel et al. 1997; Dollard et al. 2003) exposure to exacerbating and enduring pressure (Bishopp et al. 2016), including stressors such as role conflicts and ambiguity, work overload, underutilisation of skills, lack of supervisor support, bureaucratic procedures, insufficient staffing, and record keeping (Berg et al. 2006; Kop et al. 1999; Shane 2013, 2020; Violanti et al. 2017). In addition, stressors from the sociopolitical context of policing (Demou et al. 2020; Saunders et al. 2019; Stratton 1978) are also involved. Sociopolitical pressure refers to the ways in which employees in the police are treated and trusted by the public, media, other organisations, or family and friends (Brown 2016; Can et al. 2015; Ermasova et al. 2020; Van Hasselt et al. 2003).

Cognitions and subsequent emotions are important considerations in behavioural responses to stimuli (Anshel et al. 1997; Robinson 2018). Serious physiological adverse health outcomes in policing include musculoskeletal disorders (Douma et al. 2018; Larsen et al. 2018), cardiovascular diseases, and metabolic syndrome (Violanti et al. 2018a, b; Yamauchi et al. 2018; Zimmerman 2012). Examples of psychological and behavioural adverse health outcomes reported by employees in the police service include burnout (Adams and Mastracci 2020; Kop et al. 1999; McCarty et al. 2019), depression, anxiety, suicide (Berg et al. 2003; Bishopp and Boots 2014; Violanti et al. 2009, 2019; Violanti et al. 2013a, b), sleep disorders (Hartley et al. 2014; Ma et al. 2019), and posttraumatic stress disorder (PTSD) (Lees et al. 2019; Lilly et al. 2009; Stephens and Long 1998; Violanti et al. 2018a, b).

Psychometric Properties

The psychometric properties of measurement instruments refer to their reliability and validity. The evaluation of psychometric properties tries to establish the scientific robustness of the scale and the assessments made (de Souza et al. 2017). As the phenomenon of stress cannot be directly observed or quantified through self-report measures, the methodological approach employs an indirect measurement design, i.e., a scale on which respondents rate their perceptions of stress-related sources or events. The indirect approach is a hypothetical construct in which a latent variable (of stress), composed of carefully evaluated and selected items, is measured.

Neither reliability nor validity refers to inherent properties of the measure but to interactions among the scales, the group being tested, and the conditions (Keszei et al. 2010). Reliability is a property of the measurement as a whole (Danner 2016) and indicates whether the measurement is consistently able to reproduce similar results across time and space (Keszei et al. 2010). Validity refers to the meaning and interpretation of the scores; do we measure what we intend to measure?

As measurements cannot be valid unless they are reliable (Keszei et al. 2010), reliability is a way of assessing the psychometric properties of measurements. Cronbach's alpha assesses the degree to which a scale or composite is consistent, whether internally or temporally, in measuring variation in a sample (Edwards et al. 2021) and represents one way, among others, to assess reliability. Known discussions of the limitations of the use of Cronbach's alpha compared to other methods are its assumptions of uncorrelated errors, tau equivalence, unidimensionality, and normality (Trizano-Hermosilla and Alvarado 2016). Nevertheless, Cronbach's alpha is the most commonly used reliability index (McNeish 2018; Peterson 1994; Raykov and Marcoulides 2019). The expression of alpha, a number between 0 and 1, indicates higher consistency with a higher score. Although universally accepted norms seemingly are lacking, Nunnally's (1978) recommendations that acceptable levels of reliability are ≥ 0.70, ≥ 0.80, and ≥ 0.90 for preliminary, basic, and applied research, respectively, have been widely applied.

Aims of the Study

Despite a growing body of research into the concept and measurement of stress among police (Cohen et al. 2019; Webster 2014), there is no systematic body of evidence that establishes the rigour of existing stress measures and their psychometric properties. In a police setting, a lack of knowledge concerning the utility of existing stress measures hampers the development of the research field as well as the possibility of promoting wellbeing and preventing ill health (Slate et al. 2007). This study establishes the rigour of existing and applied measures of stress among police by conducting a scoping review that investigates (1) existing stress measurements in the context of the policing profession and (2) the psychometric properties of such measures. In this study, we employ an acceptable Cronbach's alpha score to

express a measurement's ability to detect and systematically investigate the type and form of stress that it is assumed to measure when applied to the police.

Method

Procedure

Research into stress among police is characterised by a plethora of definitions, measurements, and methods. A scoping review approach allows openness to stress as a concept and to study designs (Tricco et al. 2018). As our aim is to map and summarise existing measurements of stress among police, the criteria for choosing a scoping review approach were fulfilled (Munn et al. 2018; Peters et al. 2020, 2015).

Search Methods

The first and second authors (LR and BB) planned the study and decided on search terms. The PICO approach (Schardt et al. 2007) was used in discussions with two librarians (HS, the fourth author, and ATK). Databases were chosen to investigate the literature (i.e., articles that we call records in the following) published in the fields of medicine, psychology, law enforcement, and science in general. HS and ATK planned and conducted searches from the inception of the project to June 2019 without any restrictions in MEDLINE (Ovid), Embase (Ovid), PsycINFO (Ovid), AMED (Ovid), The Cochrane Library (Wiley), CINAHL (EBSCO), Academic Search Premier (EBSCO), Criminal Justice Abstracts (EBSCO), International Security & Counter Terrorism Reference Center (EBSCO), and Scopus. The searches pertained to subject headings (where applicable) and to words in the text concerning police and law enforcement, combined with terms for perceived stress, work-related stress, demands, requirements, or working conditions. For complete search strategies, see the Appendix. All search results were exported to EndNote, and duplicates were removed.

Inclusion and exclusion criteria

Criteria for inclusion were first and foremost that the record included a measurement or an inventory tool pertaining to stress that was applied in a police setting. Both qualitative and quantitative studies were included, as measurements may be applied in both. The inclusion and exclusion criteria are reported in Table 1.

Screening Process

The first two steps in the screening process used the internet and the mobile tool Rayyan (Ouzzani et al. 2016). In the screening process, we restricted inclusion to English or Nordic languages only. See Fig. 1 for a flow diagram describing the process based on the PRISMA procedure (Moher et al. 2009).

Rayyan was used by two reviewers to screen the same records independently before comparing the results. This procedure was used to ensure transparency, clarity, and traceability throughout the selection process. LR performed the initial screening process, assessing titles and abstracts. This process reduced the number of eligible records from 16,231 to 2191. The second part was organised in five waves, which were completed in pairs by LR alongside either BB, KIF (the third author), or BL (the final author) using the blind mode of Rayyan. Between every wave and before starting the next wave, each pair completed dialogues to resolve conflicting decisions. This procedure contributed to the task of establishing interrater reliability for each pair and wave. The number of conflicting decisions decreased from 15 to 6%. Records judged as possibly relevant based on titles and abstracts ($n = 956$) were read in full.

Table 1 Inclusion and exclusion criteria

Inclusion	Exclusion
Sample: Police officers; police employees without police education; staff employed in police or law enforcement professions	Nonpolice personnel, recruits, students, or employees in nonpolice occupations
Phenomenon of interest: Studies subjectively measuring work related stress among employees in the police or law enforcement	Studies in which stress was measured biometrically (blood pressure, heart rate, cortisol, saliva, etc.), animal studies (police dogs, horses, ants, etc.), studies only concerning outcomes (burnout, sleep deprivation, PTSD), coping, shift-work, job satisfaction, or quality of life were also excluded if they did not include a measurement of subjective stress
Type of publications: Peer-reviewed	Reviews, nonpeer-reviewed publications (e.g., theses, dissertations, conference papers, book sections), publications focusing on historical, ethical, legal, or other issues without using a measurement of stress
Design: Quantitative and qualitative studies	Qualitative studies in which there was no structure that allowed for a measurement of stress

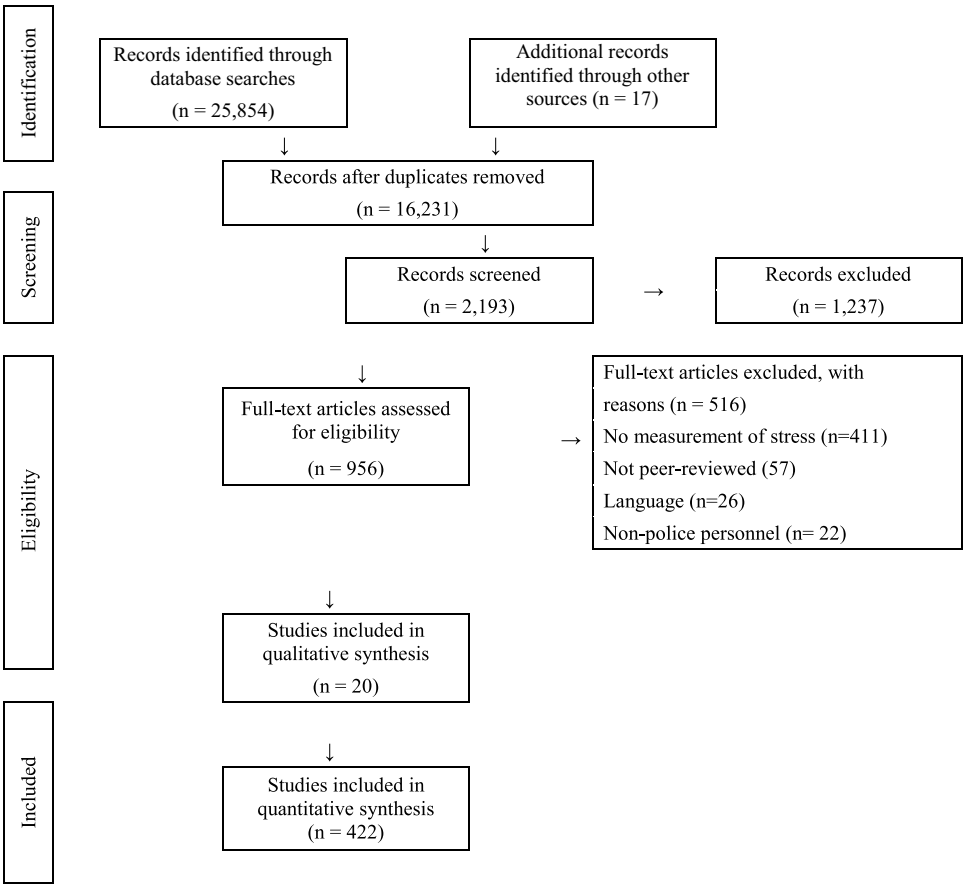

Fig. 1 Summary of search, adapted from PRISMA

Data Extraction

Based on 956 records, a total of 20 qualitative studies and 422 quantitative studies were found to be relevant. From the included studies, measurements of subjective stress among employees in the police and the psychometric properties (i.e., Cronbach's alpha) of such measurements were extracted.

Results

This scoping review investigates (1) existing stress measurements in the police context and (2) the reliability of such measurements as measured by Cronbach's alpha.

The 20 qualitative studies provide insight into the early establishment and identification of the factors that contribute to police stress (Kroes et al. 1974a, b; Wexler and Logan 1983). However, the qualitative studies did not include measurements of stress in the form of closed questions or checklists and were therefore excluded from further analyses.

Based on 422 quantitative studies, we identified that 129 unique subjective measurements of stress had been used in police research. Within this group, 89 measurements reported psychometric properties (Cronbach's alpha), which ranged between 0.16 and 0.96. A slight majority (54%, $n = 70$) of the measurements reported a Cronbach's alpha score over 0.80, indicating satisfactory reliability among the police population.

The measures were divided into four major categories based on the ways in which they predominantly examine and target different aspects of the police stress phenomenon: police-specific (46 measurements, Table 2), perceived stress (23 measurements, Table 3), psychological and physiological outcomes as well as mood and affect (30 measurements, Table 4), and assessment batteries (30 measurements, Table 5). The four categories overlap in certain respects (e.g., common features concerning how stress is measured) and differ in terms of conceptual issues and national contexts of development and application. Most measures also seem to be combined when applied to the police. For example, police-specific measures are applied in combination with one or more measures from one of the other main categories.

The measurements are arranged chronologically based on when they were first developed. Information concerning at least one study in our material in which the measure was used, as well as information concerning any revised versions, are included. The tables list, from left to right, the name of the measurement, its abbreviation, the name of the developer(s), and the measurement's years of development

Table 2 Police-specific work demand/stress measurements

No	Name	Abbreviation	Author	Number of items	Response scale (*)	Cronbach's alpha (*a*)
1	Police Stress Survey Modified Police Stress Survey	PSS, MPSS	Spielberger et al. 1981; White et al. 1985; Patterson 1992; Martelli et al. 1989; Slate et al. 2007; Padilla 2020	60/85/ 59/44	1–100* 10-point * 6-point	0.70–0.97
2	Hassles Scale/Police Daily Hassles Scale	HS/PDHS	Kanner et al. 1981; Hart et al. 1993	117/86	5-point	0.91
3	Police Daily Uplift scale	PDUS	Kanner et al. 1981; Hart et al. 1993	82	5-point	0.77
4	Sources of stress among supervisory police officers[a]		Cooper et al. 1982	98	6-point	
5	Items Composing Stressor, Support, and Stress Scales		Cullen et al. 1982, cited in Cullen et al. 1985	38	7-point	0.64-0.75
6	Law Enforcement Critical Life Events Scale	LECLES, LECLES-R	Sewell 1983; (Sewell 1980); Coman et al. 1991a, b	137/128	6*	≥0.70
7	Situation Stress Inventory[b]	SSI	Gudjonsson and Adlam 1983, cited in Gudjonsson and Adlam 1985	45	1–100	
8	Peace Officer Standards and Training	POST	Georgia's Peace Officer Standards and Training Council 1983, cited in Anson et al. 1997	37	5-point	
9	Police Stress Inventory	PSI	Lawrence 1984; Lord et al. 1991	60/40	3-point* 5-point*	0.86
10	Job Stress Rating Scale	JSRS	Taiwo 1985, cited in Oyefese 1989	11	6-point	0.85
11	Occupational Stress Inventory	OSI	Joseph and Dharmangadan 1988, cited in Dharmangadan 1988	120	5-point	0.67–97
12	Police stressors and felt stress inventory		Brown and Campbell 1990	54	4-point*	
13	Identify principal sources of stress[a]		Crank and Caldero 1991	1	Open	
14	Stress questionnaire developed by reviews[a]		Bartol et al. 1992	87	5-point	
15	Police Stress Inventory		Suresh 1992, cited in Nandini et al. 2015	80		0.75
16	Stress factors and effects of police work[a]		Savery et al. 1993	30	7-point	
17	Police Stress Scale		Beehr et al. 1995, cited in Gershon et al. 2009	25	5-point*	
18	Indices of Institutional and Organizational Variables		Crank et al. 1995	18	5-point	0.69–0.93
19	Officer Stress Survey	OSS	Lord 1996	86	5-point	0.16–0.92
20	Sources of acute stress[ab]		Anshel et al. 1997	17	5-point*	
21	Police Stress Questionnaire	PSQ	Biggam et al. 1997	36	5-point	
22	Police Officer Questionnaire	POQ	Delprino et al. 1997 cited in Rose and Unnithan 2015	3	5-point	0.814
23	Boston Police Officer Survey	BPOS	Police Dep. Research Office, Boston 1997, cited in Garcia et al. 2004	21	100	0.89
24	Indications of experienced events*[b]		Robinson et al. 1997	25	3-point	

Table 2 (continued)

No	Name	Abbreviation	Author	Number of items	Response scale (*)	Cronbach's alpha (*a*)
25	Policing Event Scale[b]	PES	Brown et al. 1999	28	4-point*	
26	Stressful and rewarding work aspects[a]		Kop et al. 1999	20 + 13	open	
27	Police Perceived Stress Survey		Laufersweiler-Dwyer and Dwyer 2000	50 + 14	4 point *	0.84–0.86
28	Jong Mok Lee Scale of Police Stress		Jong Mok Lee 2002, cited in Lee 2002	31	5-point	0.761
29	Work Environment Inventory	WEI	Liberman et al. 2002; Marmar et al. 2006	68	5-point	0.92
30	Law Enforcement Work Assessment Survey	LEWA	Scott 2002, cited in Scott 2004	24	10-point	0.76–0.84
31	Officers' perception of stress*		Taylor Greene and del Carmen 2002	5	5-point	0.87
32	Police Stress Inventory	PSI	Pienaar and Rothmann 2003 cited in Pienaar et al. 2007	44	9-point	0.89–0.92
33	Law Enforcement Officer Stress Survey	LEOSS LEOSS-R	Van Hasselt et al. 2003; Van Hasselt et al. 2008; Can et al. 2015	25/18	5-point*	0.923 0.74–0.87
34	Police Stress Questionnaire	PSQ	Ranta 2004, cited in Ranta and Sud 2008	45		
35	Norwegian Police Stress Survey	NPSS	Berg et al. 2005	10	1–100*	0.76–0.83
36	Work stressors among Israeli police[a]		Malach-Pines and Keinan 2005	30	5-point	0.94
37	Police Stress Questionnaire-Op	PSQ-Op	McCreary and Thompson 2006; McCreary et al. 2017	20	7-point	0.90–0.94
38	Police Stress Questionnaire-Org	PSQ-Org	McCreary and Thompson 2006; McCreary et al. 2017	20	7-point	0.89–0.93
39	Female officer stress sources[a]		Thompson et al. 2006	16	5-point	
40	Antoniou Police Stress Inventory	APSI	Karanika-Murray et al. 2009	55	6-point	0.86
41	Public Police – Security Professionals Stress Questionnaire	QSPS-P	Gomes 2010, cited in Gomes et al. 2016	25	5-point	0.86–0.93
42	Critical Incident History Questionnaire	CIHQ	Weiss et al. 2010	34	5-point	0.94
43	Exposure to harassment and role-specific job demands and resources[a]		Tuckey et al. 2012		5-point	≥ 0.73
44	Daily Perceived Stress Level[a]		Korre et al. 2014	22	10-point*	
45	Police Stress Questionnaire	PSQ	Wang et al., 2014	22	5-point	
46	Police Work Experience Survey	PWES	Bishopp et al. 2018	24	5-point 7-point	

*Response scales measuring both perceived severity and frequency of occurrence

[a]Name given by LR

[b]Events or situations

Table 3 Perceived stress measurements

No	Perceived stress	Abbreviation	Author	Number of items	Response scale	Cronbach's alpha (*a*)
1	The Social Readjustment Rating Scale	SRRE	Holmes and Rahe 1967, cited in Collins and Gibbs 2003	56	Mixed	0.89–0.96
2	Schedule of Recent Experiences	SRE	Holmes 1967, cited in Burke et al. 1984	42	Mixed	0.70–0.88
3	The Stress Profile		Girdano and Everly 1973, cited in Leitner et al. 1983	9		
4	Occupational Work Questionnaire	OWQ	Caplan et al. 1975	4	7-point	0.78
5	Chronic and Episodic Stress		Adam 1978; Adams et al. 1978, cited in Anson and Bloom 1988	45	5 point	
6	Stress in General Scale		Ironson and Smith 1978; Ironson et al. 1989, cited in Kohan and O'Connor 2002	5	7-point	0.81
7	Personalized Assessment of Stress Scale	PASS	Morse and Frost 1979, cited in Anson et al. 1997	27	5-point	
8	Frequency of stress symptoms and feeling after work[a]		Lester and Gallagher 1980	3	4-point	
9	Perceived Stress Scale	PSS-14/PSS-10	Cohen et al. 1983; Cohen and Williamson 1988, cited in Graf 1986	14/10	5-point	0.85
10	Presumptive Stressful Life Event Scale	PSLE	Singh et al. 1984, cited in Roz and Raval 2017	51		0.80
11	Visual Analog Scale	VAS	Arnetz et al. 1985, cited in Arnetz et al. 2009	1	1–100	
12	Subjective stress[a]		Motowidlo et al., 1986, cited in Young 1994	4	5-point	0.79–0.896
13	NASA Task Load Index	NASA TLX	Hart and Staveland 1988, cited in Chiorri et al. 2015	6	20-point	Low
14	Stress/Energy Questionnaire		Kjellberg and Iwanowski 1989, cited in Garcia et al. 2017	12	6-point	Stress: 0.72 Energy: 0.53
15	Stress Appraisal Measure	SAM	Peacock and Wong, 1990, Anshel et al., 1997	28/33	5-point	0.71–0.86
16	Work Stress Scale[a]		Revicki et al. 1993; Gershon et al. 1995; 1999, cited in Gershon et al. 2009	11	4-point	0.85–0.91
17	Measure of Occupational Stress[a]		Morash and Haarr 1995; Haarr and Morash, 1999; Morash et al., 2006	4	5-point	0.77
18	Screening Scale of Chronic Stress	SSCS	Schulz and Schlotz 1999, Schulz et al. 2003, 2004, cited in Strahler and Ziegert 2015	12	5-point	0.91
19	Strain-based work-family conflict		Carlson et al. 2000, cited in Qureshi et al. 2016	6	5-point	0.75
20	Job stress measurement[a]		Lait and Wallace 2002, cited in Tyagi and Dhar 2014	6	7-point	0.88
21	Officers' perception of stress[a]		Taylor Greene and del Carmen 2002; del Carmen et al. 2007	5	5-point	0.87
22	Management Standard Indicator Tool — How stressful do you find your job	HSE MS	HSE Health and Safety Executive 2004, Edwards 2008, cited in Allisey et al. 2014	1	5-point	
23	General level of stress[a]		Malach-Pines and Keinan 2005	1		

[a]Name given by LR

Table 4 Measurements of psychological distress, physiological complaints, and/or mood and affect changes

No	Name	Abbreviation	Author	Number of items	Response scale	Cronbach's alpha (*a*)
1	Mental Health Index	MHI	Langner 1962	22	2-point	0.77
2	Subjective Units of Distress Scale	SUDS	Wolpe 1969 cited in Taverniers et al. 2011	1	10-point	
3	State Trait Anxiety Inventory	STAI	Spielberger et al. 1970; 1983, cited in Coman et al. 1991a, b	20 + 20	4-point	0.74–0.86
4	Profile of Mood States	POMS	McNair et al. 1971, cited in Garbarino et al. 2012	58	5-point	0.74–0.93
5	General Health Questionnaire	GHQ12 GHQ28	Goldberg and Williams 1988, cited in Brown et al. 1999	12/28	4-point	0.679–0.91
6	Symptom Checklist	SCL-90 SCL-90R	Derogatis 1975; Derogatis and Lazarus 1994, cited in Van Patten and Burke 2001	90/56	5-point	0.84–0.97
7	Eight State Questionnaire	8SQ	Curran and Cattell 1976, cited in Nathawat and Dadarwal 2014	96	4-point	
8	Short Adjective Checklist Stress Arousal Checklist S Stress Arousal Checklist A	SACL SACL-S SACL-A	Mackay et al. 1978; Gotts and Cox 1988, cited in Hart et al. 1993	4/18/12	4-point 4-point 4-point	0.92 0.93 0.88
9	Psycho-Physiology Anxiety Reactions	PAR	Rose et al. 1978, cited in Lord et al. 1991	19		
10	Impact of Event Scale	IES/IES-R	Horowitz et al. 1979, cited in Weiss et al. 1995	15/22	5-point	0.87–0.952
11	Willcher test		Willcher 1980, cited in Lester and Solis 1981	20	4-point	
12	Brief Symptom Inventory	BSI	Derogatis and Melisaratos 1983, cited in Mearns and Mauch 1998	53	5-point	0.49–0.97
13	Positive And Negative Affect Schedule	PANAS	Diener and Emmonds 1984, Watson et al. 1988 cited in Hart et al. 1994	10 + 10	5-point	PA: 0.86–0.90 NA: 0.84–87
14	Work Stress Scale[x]		Cullen et al. 1985	6	7-point	0.78
15	Emotional Stress Reaction Questionnaire	ESRQ	Larsson 1987, cited in Larsson et al. 1988	18	4-point	0.66–81
16	Psychosomatic Complaints Scale of Stress	PSCSS	Greller and Parsons 1988, cited in Greller and Parsons 1992	31	5-point	0.91
17	Kessler Psychological Distress Scale	K10/KPDS	Kessler and Mroczek 1994, cited in Noblet et al. 2009	10	5-point	0.93–0.94
18	Negative Attitude to Emotional Expression Scale		Joseph et al. 1994, cited in Brown and Grover 1998	20	5-point	0.91
19	Medical Outcomes Study Short-Form Health Survey	MOS-SF 36	Ware et al. 1994, cited in Iwasaki et al. 2002	36	10-point	
20	Depression, Anxiety, and Stress Scale	DASS	Lovibond and Lovibond, 1995, cited in Richmond et al. 1998	42/21	4-point	0.74–0.94
21	Distress Thermometer	DT	Roth et al. 1998, cited in Acquadro Maran et al. 2014	36	10-point	
22	Rapid Stress Assessment Scale	RSA	Tarsitani and Biondi 1999, cited in Pancheri et al. 2002	15	4-point	0.70–0.92
23	Patient Health Questionnaire	PHQ	Kroenke et al. 2002, cited in Hall et al. 2010	9/15	3-point	
24	Lipp Stress Symptoms Inventory	(L)SSI	Lipp 2000, cited in Lipp 2009	53	2-point	0.42
25	Toulouse Stress Scale	TSS	Bailly et al. 2004, cited in Bonnet-Suard et al. 2005	30	5-point	0.83
26	Secondary Traumatic Stress Scale	STS	Bride et al. 2004, cited in Craun et al. 2014	17	5-point	0.91

Table 4 (continued)

No	Name	Abbreviation	Author	Number of items	Response scale	Cronbach's alpha (*a*)
27	Professional Quality of Life	ProQOL	Stamm 2005; 2010, cited in Burnett et al. 2019	30	5-point	
28	Stress of Conscience Questionnaire	SCQ	Glasberg et al. 2006, cited in Backteman-Erlanson et al. 2013	9	7-point	0.83
29	Psychological Injury Risk Indicator	PIRI	Winwood et al. 2009; Winwood et al. 2012	30	7-point	0.83
30	Acute Stress Response Scale	ASRS	Yang et al. 2011	112	2-point	0.952

and/or revision. The psychometric properties (Cronbach's alpha) are listed, if indicated, in the last column. To enhance the informative value of the reported alpha levels, the table also includes the number of items and length of the response scale. Alpha scores are reported as a fixed number or range from the lowest to the highest subscale, depending on the information available. Full reference details for the content of all measurements in Tables 2, 3, 4 and 5 are included as active electronic links.

Table 2 includes 46 unique police-specific measures, all of which include a greater or lesser number of the two primary stress sources affecting police employees: operational and organisational stressors. About half of the measurements ($n=22$) indicate satisfactory reliability (>0.80) among the police population. Measurements based on lists of events and situations such as 'Sources of acute stress' (Anshel et al. 1997) or 'Policing Event scale' (PES) (Brown et al. 1999) do not provide reliability estimates. Such scales are considered formative, which implies that high correlations among items are not expected. Experiencing one event does not increase the probability of experiencing another. In all the measurements, respondents were asked to rate the severity and/or frequency of the included stressors or situations.

Police-specific measures are characterised by a desire to capture the stress of a demanding occupation in which individuals face increased challenges and changing roles in their work. The measurements differ in terms of how they are constructed. Some measurements (e.g., 'Police Stress Questionnaire' (PSQ) (Biggam et al. 1997), 'Police Daily Hassles Scale'/ 'Police Daily Uplift Scale' (PDHS/PDUS) (Hart et al. 1993; Kanner et al. 1981), and 'Police Stress Questionnaire-Operative'/ 'Police Stress Questionnaire-Organisational' (PSQ-Op/PSQ-Org) (McCreary et al. 2017; McCreary and Thompson 2006) organised stressors into two scales in which operational and organisational stressors are measured as latent variables. Other measurements, such as the 'Occupational Stress Inventory' (OSI) (Dharmangadan 1988), 'Police Stress Survey' (PSS) (Martelli et al. 1989; Padilla 2020; Patterson 1992; Slate et al. 2007; Spielberger et al. 1981; White et al. 1985), and 'Police Stress Questionnaire' (PSQ) (Wang et al. 2014), include subscales inside the two segments in a manner similar to multidimensional assessment batteries (see Table 5). In the operational segment, we find questions of physical and psychological danger, dealing with domestic violence, and equipment issues.

In the organisational segment, we find questions concerning lack of support, workload, boredom, personal relations, and external sociopolitical variables (such as public relations, home-work balance, media pressure, and court issues). In addition, some measurements are constructed to investigate stressors in the daily routine, e.g., 'Police Daily Hassles Scale'/ 'Police Daily Uplift Scale PDHS/PDUS' (Hart et al. 1993; Kanner et al. 1981) 'Work Environment Inventory' (WEI) (Liberman et al. 2002; Marmar et al. 2006), and 'Daily Perceived Stress Level' (Korre et al. 2014). Others, such as 'Sources of acute stress' (Anshel et al. 1997) and 'Policing Event scale' (Brown et al. 1999), are concerned with acute stressors. A few measurements include questions regarding responses and outcomes (e.g., burnout, anxiety) or mood changes such as anger, e.g., 'Stress factors and effects of police work' (Savery et al. 1993), 'Police Work Experience Survey' (PWES) (Bishopp et al. 2018), and 'Police Officer Questionnaire' (POQ) (Delprino et al. 1997; Rose and Unnithan 2015).

Overall, police-specific stress measurements have been developed for a variety of purposes ranging from development programs, e.g., the 'Policing Event Scale' (PES) (Brown et al. 1999), 'Police Stress Inventory' (PSI) (Pienaar and Rothmann 2003; Pienaar et al. 2007) and PSS (Martelli et al. 1989; Padilla 2020; Patterson 1992; Slate et al. 2007; Spielberger et al. 1981; White et al. 1985), predicting employees at risk, e.g., 'Police Perceived Stress Survey' (Laufersweiler-Dwyer and Dwyer 2000) or 'Law Enforcement Officer Stress Survey' (LEOSS) (Can et al. 2015; Van Hasselt et al. 2008, 2003), estimating average work distribution, e.g., 'Daily Perceived Stress Level' (Korre et al. 2014), to improving knowledge concerning how to cope, e.g., 'Sources of acute stress' (Anshel et al. 1997).

Table 3 includes 23 measurements assessing perceived stress. Among this group, 48% ($n=11$) reported an alpha score over 0.80. Measurements in this category contain questions in which respondents are explicitly asked about perceived or experienced stress in general, at work, or in specific settings.

Table 5 Assessment batteries measuring occupational workload/stress/demands

No	Name of measurement	Abbreviation	Author	Number of items	Response scale	Cronbach's alpha (*a*)
1	Job demand stress		House and Rizzo 1972, cited in White and Marino 1983	26	2-point	
2	Quantitative Workload Scale	QWS	Caplan et al. 1975, cited in Pendergrass and Ostrove 1984	117	5-point	0.575–0.86
3	Personalized Assessment Stress Scale	PASS	Morse and Frost 1979 cited in Anson et al. 1997	27	5-point	
4	Cherniss model of work stress		Cherniss 1980, cited in Burke et al. 1984	14		0.86–0.88
5	Occupational Stress Index Occupational Stress Inventory	OSI OSI-R	Srivastava and Singh 1981, 1984, cited in Roz and Raval 2017; Osipow and Spokane 1984, 1998, cited in Yu et al. 2016; Joseph and Dharmangadan 1988; cited in Dharmangadan 1988	46/57/120/140	5-point 5-point	0.9–0.935 0.67–0.97
6	Organisational Role Stress Scale	ORS(S)	Pareek 1983, cited in Tundwal and Behmani 2016	50	5-point	
7	ERI-Effort Reward Imbalance	ERI	Siegrist 1984, 2002, cited in Garbarino et al. 2011	35/23	4/5-point	0.82/0.89/0.79
8	Masculine Gender Role Stress	MGRS	Eisler and Skidmore 1987, cited in Tang and Lau 1996	40	6-point	0.73–0.90
9	Occupational Stress Indicator/Index	OSI OSI-2	Cooper et al. 1988, cited in Robertson et al. 1990; Evers et al. 2000; Siu 2002	167/61/46/94	5/6-point	0.73–97
10	Work Stress Inventory	WSI	Barone et al. 1988, cited in Simons and Barone 1994	40	5/4-point	≥ 0.83
11	Life Stressors and Social Resources Inventory	LISRES	Moos et al. 1988, cited in Iwasaki et al., 2002	85	4/5-point	
12	Professional Life Stress Scale	PLSS	Fontana 1989, cited in Ramakrishnan et al. 2013	24	3-point	
13	Feminine Gender Role Stress	FGRS	Gillespie and Eisler 1992, cited in Tang and Lau 1996	39	6-point	0.73–0.90
14	Occupational Stress Questionnaire	OSQ	Gmelch and Chan 1994, cited in Singh and Kar 2015	78	5-point	0.92–0.99
15	Job Stress Survey	JSS	Spielberger and Reheiser 1994, cited in Haisch and Meyers 2004	60/30	9 point	0.83–0.92
16	Mental Health Professional Stress Scale	MHPSS	Cushway et al. 1996, cited in Zefferino et al. 2006	42	4-point	0.60–0.87
17	Queensland Public Agency Staff Survey	QPASS	Hart et al. 1996 cited in Dollard et al. 2013	5	5-point	
18	Job Content Questionnaire Demand/Control/Support Questionnaire	JCQ/DCS	Karasek et al. 1998; Sanne et al., 2005, cited in Garbarino et al. 2011	31/17	4-point	≥ 0.70 0.71/0.65/0.84
19	Pressure Management Indicator	PMI	Williams and Cooper 1998, cited in Kirkcaldy and Shephard 2001	120	5-point	0.64–0.89
20	Dutch VBBA		van Veldhoven et al. 1997, 2002 cited in Van den Broeck et al. 2010	9	4-point	≥ 0.91
21	Perceived Job Stress Questionnaire	PJSQ	Dudek et al. 1999 cited in Oginska-Bulik 2005	55		
22	Baltimore, Maryland		Gershon 1999, cited in Gershon et al. 2009	132	Mixed	0.872
23	Trier Inventory for the Assessment of Chronic Stress	TICS	Schulz and Schlotz 1999; Schulz et al. 2003, 2004 cited in Gerber et al. 2013	57	5-point	

Table 5 (continued)

No	Name of measurement	Abbreviation	Author	Number of items	Response scale	Cronbach's alpha (*a*)
24	Brief Job Stress Questionnaire	BJSQ	Shimomitsu et al. 2000 cited in Shiozaki et al. 2017	62	4-point	
25	Management Standards Indicator Tool	MS Indicator Tool	Cousins et al. 2004 cited in Edwards et al. 2008	35	5-point	0.78–0.88
26	A Shortened Stress Evaluation Tool	ASSET	Faragher et al. 2004 cited in Johnson et al. 2005	46/6	6-point	0.762–0.87
27	Demand-Induced Strain Questionnaire	DISQ	de Jonge et al. 2004 cited in Bova et al. 2013	30	5-point	
28	Job-Demands Resources Scale	JDRS	Rothmann 2006 cited in Rothmann et al. 2006	48	4-point	0.71–0.90
29	Korean Occupational Stress Scale	KOSS	Chang et al. 2005	43/24	4-point	
30	DECORE-21	DECORE	Luceño-Moreno and Martín-Garcia 2008 cited in Talavera-Velasco et al. 2018	44/21	5-point	0.81–0.85

Some measurements are constructed to assess the perception of overall occupational stress. Typical items could be 'I feel a great deal of stress because of my job ', 'When I'm at work I often feel tense or uptight' or 'I feel pressured', for example, in 'Occupational Work Questionnaire' (OWQ) (Caplan et al. 1975), 'Measure of Occupational Stress' (Haarr and Morash 1999; Morash et al. 2006; Morash and Harr 1995), and 'Subjective Stress' (Motowidlo et al. 1986; Young 1994). Other measurements examine overall, global stress, not necessarily stress linked specifically to work, with items such as 'How often have you felt that you were unable to control important things in your life', 'In the last month, how often have you been upset because of something that happened unexpectedly', or 'In the past year, how would you rate the amount of stress in your life', e.g., 'Perceived Stress Scale' (PSS-14, PSS-10) (Cohen et al. 1983; Cohen and Williamson 1988; Graf 1986) and 'Personalized Assessment of Stress Scale' (PASS) (Anson et al. 1997). Table 3 also includes measurements assessing experiences of life events such as the death of a loved one, marital issues, and economic difficulties, e.g., 'Stress Appraisal Measure' (SAM) (Anshel et al. 1997; Peacock and Wong 1990), 'The Social Readjustment Rating Scale' (SRRE) (Collins and Gibbs 2003; Holmes and Rahe 1967) and 'Schedule of Recent Experiences' (SRE) (Burke et al. 1984) and acute stress experiences, e.g., 'Chronic and Episodic Stress' (Anson and Bloom 1988), 'Measure of Occupational Stress' (Haarr and Morash 1999; Morash et al. 2006; Morash & N. Haarr, 1995), and 'Screening Scale of Chronic Stress' (SSCS) (Strahler and Ziegert 2015).

Table 4 includes 30 measurements. The measurements in this category investigate the presence of stress through impairment of functioning due to common types of psychiatric, physiological, or behavioural symptoms or mood changes resulting from prolonged or acute stress exposure among police employees. Sixty-three percent ($n = 19$) of the measurements reported Cronbach's alpha score over 0.80. Horrors from the world wars contributed to the growing scholarly agreement concerning a strong relationship between exposure to stress and the subsequent onset of various forms of illness. Additionally, studies conducted during the 1960s identified personal and situational factors mediating the extent of illness.

Examples of instruments measuring physiological outcomes such as headaches, back pain, and ulcers include, e.g., 'Psychosomatic Complaints Scale of Stress' (PSCSS) (Greller and Parsons 1988, 1992) 'Lipp Stress Symptoms Inventory' (L)SSI) (Lipp 2009), 'Psycho-Physiology Anxiety Reactions' (PAR) (Lord et al. 1991), and 'Medical Outcomes Study Short-Form Health Survey' (MOS-SF36) (Iwasaki et al. 2002). Examples of instruments measuring psychological outcomes, such as anxiety, depression, and discomfort, include the 'Symptom Checklist' (SCL-90) (Van Patten and Burke 2001), Brief Symptom Inventory (Derogatis and Melisaratos 1983; Mearns and Mauch 1998), 'General Health Questionnaire' (GHQ) (Brown et al. 1999), 'Depression, Anxiety, and Stress Scale' (DASS) (Lovibond and Lovibond 1995; Richmond et al. 1998), 'State-Trait Anxiety Scale' (STAI) (Coman et al. 1991a; Spielberger et al. 1970), and 'Psychological Injury Risk Indicator' (PIRI) (Winwood et al., 2012, 2009). Certain measures also investigate behavioural symptoms such as arousal, intrusion, avoidance, sleep problems, excessive drinking, and withdrawal, for example, 'Negative Attitudes to Emotional Expression Scale' (Brown and Grover 1998), 'Toulouse Stress Scale' (TSS) (Bonnet-Suard et al. 2005), 'Secondary Traumatic Stress Scale' (STS) (Bride et al. 2004; Craun et al. 2014), 'Impact of Event Scale' (IES) (Horowitz et al. 1979; Weiss et al. 1995), and 'Willcher test' (Lester and Solis 1981). In addition, mood and affect changes

such as aggression, anger, and sadness are measured, e.g., 'Emotional Stress Reaction Questionnaire' (ESRQ) (Larsson et al. 1988), 'Work Stress' (Cullen et al. 1985), 'Eight State Questionnaire' (8SQ) (Nathawat and Dadarwal 2014), 'Stress Arousal Checklist-Stress'/'Stress Arousal Checklist-Arousal (SACL-S, SACL-A) (Hart et al. 1993; Mackay et al. 1978), and 'Positive and Negative Affect Schedule' (PANAS) (Hart et al. 1994; Watson et al. 1988). Measurements of acute stress reactions, e.g., 'Rapid Stress Assessment' (RSA) (Pancheri et al. 2002) and 'Acute Stress Response Scale' (ASRS) (Yang et al. 2011), are also included. Measurements in this category examine the presence of a variety of adverse health reactions, symptoms, and mood changes and are not primarily developed to measure exposure to occupational stress.

Table 5 includes 30 batteries of measurements. In this group, 63% ($n = 19$) reported Cronbach's alpha score, most of which were above 0.80. Batteries of measurements are mostly comprehensive and multidimensional. These batteries are constructed with several subscales and developed for general use in studies concerning occupational stress. Measurements in this category typically embrace what Cooper and Robertson, cited in Hesketh et al. (2019), refer to as the 'six essentials', which are resources and communications, control, work relationships, balanced workloads, job security, change, and job conditions. Most measurements also include sociopolitical issues such as home-work issues, political pressure, relations with the public or society, occupational status, and organisational changes. Thus, measurements in this category gauge stress in the form of working demands and requirements of organisations in general.

Discussion

This paper aims to provide an overview of existing and applied stress measures among employees of the police, as well as an overview of the rigour of these measures. According to the scoping review, 129 unique subjective measurements have been used to assess stress among police (see Tables 2, 3, 4 and 5), and these measures appear to work well, with a slight majority of measurements having Cronbach's alpha over 0.80.

One hundred twenty-nine measurements represent four categories that address different aspects of stress as a phenomenon and the transactional framework of stress. The first category is police-specific, followed by perceived stress, psychological and physiological outcomes (including mood and affect changes), and assessment batteries. Combined, these categories illustrate different assets of the complex interactions among stimuli (i.e., stressors referring to conditions causing subsequent reactions), appraisals of stress (i.e., an individual's perception of and relationship to stressors), and responses in the form of outcomes and mood changes. As a result, these categories highlight different parts of the transactional model. Robinson (2018, p. 6) noted that 'the delineation of stress into primary and secondary appraisals has moved stress research away from the purely physiological exploration of stimulus and response in the 1960s and 1970s and more towards cognitive mediation involving numerous factors and feedback loops'. Combinations of measures may improve the study of stress among police by allowing researchers to investigate the ways in which the cognitive process of appraisal acts as a mediator when confronted with a stressor (Robinson 2018). This approach may enhance the current situation, as some researchers have argued that studies of stress among police mainly focus on the nature of stressors without interpreting their results through a theoretical framework of stress (Rodrigues et al. 2019).

Items assessing severity are tightly connected to emotional reactions. This makes it possible to deduce the type of appraisal being produced (i.e., positive-benign, harm-threats, or challenges). Questions of frequency that correspond to the cumulative sum of contextual, situational, or private disturbances further inform the appraisal process. Researchers must examine respondents' personal experiences concerning both the frequency and perceived severity of encounters to interpret the corresponding appraisals (Evans and Coman 1993). According to Anshel et al. (Anshel et al. 1997, p. 349), the primary appraisal dimensions and perceived stressfulness explained more variance than the secondary appraisal scales and the reappraisals. As a result, examining the meaning that individuals attribute to different events contributes to knowledge concerning how secondary appraisals are associated with an individual's overall perceptions of stress. Hence, subjective perspectives, experiences, and perceptions of stress are critical to making long-term contributions to the research concerning work stress.

To summarise, the four categories of measurements complement one another. Police-specific measurements are derived from concrete occupational demands and events and gauge the major operational and organisational occupational requirements of policing. The other three categories focus on general and cross-occupational working demands and outcomes. Because general workplace problems account for a great deal of perceived job stress (Liberman et al. 2002), selected scales from comprehensive and multidimensional assessment batteries often contribute points of overlap and elaborations that are useful in studying working conditions among police. Furthermore, a measurement of perceived stress is often added to capture respondents' experiences of general work-related issues and overall stress in life.

Measurements of psychological and physiological outcomes, including mood and affect changes, are used to verify the presence of stress through various reactions or to

examine outcomes or mood and affect changes. However, symptoms may have multiple causes, so scales of this kind have shortcomings in regard to interpreting associations and causalities, e.g., according to Gotts and Cox (1988), quoting Mackay et al., mood changes are frequently conflated with stress in the literature (Ermasova et al. 2020).

The majority of measurements in our results are used to assess chronic stress. Measuring acute stress is more difficult and is often conducted through artificial scenarios (Arble et al. 2019; Larsson et al. 1988; Taverniers et al. 2011). When performing simulated stressful tasks, respondents know that no serious consequences will result. Consequently, it is difficult to assure the accuracy of measuring stress originating from the task (Bertilsson et al. 2019; Brisinda et al. 2015). Acute stress is frequently assessed using biomarkers (e.g., saliva, heart rate, blood serum) combined with other measurements (Sandvik et al. 2020). However, both biomarkers and subjective measurements have shortcomings. Regardless of the choice of methods, individual motivations (Ghazinour et al. 2021) and situational cues strongly affect performance, outcomes from biomarkers, and responses (Giessing et al. 2019). It is therefore essential to ensure the ecological validity of the method applied.

Generic or Specific Measurements

Altogether, measurements from the four categories provide four points of entry to studying stress among police. However, our findings show that most measures are combined when applied to the police. In other words, police-specific measures are applied in conjunction with one or more measures from one of the other main categories. One of the reasons for this combination may be that existing measurements of stress among police include both generic and police-specific measures. Generic assessment batteries, more than police-specific measurements, have evolved in response to generally new knowledge and changes in contextual factors in workplaces (Bliese et al. 2017). Using various types of measurements is a strength, as doing so connects stress among police to the general stress literature, which provides a vital occupational context. Measurements and subscales from different categories possess complementary properties and may successfully be used in conjunction and combination.

Perhaps due to our choice of search terms, most measurements we identified are directed at the negative health effects of stress. With a few notable exceptions (Hart et al. 1993; Kop et al. 1999), most stressors in the measurements we have found appeal to harm-threat appraisals rather than positive-benign and challenging appraisals. Nevertheless, stress has both positive and negative effects. As demonstrated by the upwards slope of the inverted-U curve, positive linear theory views stress as motivating and challenging, whereas the downwards slope follows the negative linear theory, which holds that stress at any level is harmful and reduces performance (Gaines and Van Tubergen 1989). This primary emphasis on detrimental effects may hamper the possibility of gaining more knowledge into job factors that promote and sustain positive forms of stress in policing work (Hart et al. 1994). Larsson et al. (Larsson et al. 1988) found officers to perceive situations as challenging more often than they perceived them to be threatening, suggesting that situations were perceived as controllable or solvable, thereby allowing officers to remain task oriented, confident, and alert. Hence, it would be inappropriate to assume that employees of the police always experience negative stress simply due to exposure. Therefore, conclusions are not straightforward and have several interpretational pitfalls. The identification of positive and negative aspects of work is invaluable for attaining a broader picture that informs both employees and employers of areas on which to focus for improving work conditions and suggesting subsequent interventions (Bakker and Schaufeli 2008; Juniper et al. 2010; Karanika-Murray et al. 2009).

Operational stressors in measurements of policing are mainly the result of police work in the form of physical exposure to citizens, the use of force, and the sense of working with a strong possibility of violence, dangerous events, or death. Notably, most operational stressors result from the aspects of policing that are performed in the streets, i.e., 'real police work' (Reuss-Ianni 2011). This fact remains true even though police work encompasses a wide range of police-specific operational tasks that are demanding in other ways (e.g., preventing and investigating cybercrime, human trafficking, or meeting people undergoing crisis). It may seem that existing police-specific measures support a somewhat outdated narrative concerning police stress. Police-specific measures of stress may profit from a better alignment with the status quo of modern police work in their region of application. It is worth noting that the growth of professional policing worldwide has been accompanied by an increasing number of civilian employees who lack police education (Adams and Mastracci 2020). Regardless of educational background, police employees also collaborate and participate in multiagency efforts, for instance, in online policing (e.g., investigations of sexual abuse and dating fraud).

Studies concerning police stress have repeatedly documented the fact that the most frequent and stressful job factors are related to the overall organisation of work salient to all staff (Shane 2020). Such general working conditions have an impact on the majority of police employees, regardless of the work tasks performed, such as real-life or virtual patrolling, investigative work, contact or dispatch personnel, and counselling or managing (Brown et al. 1996; Galbraith et al. 2021; Kirkcaldy et al. 1998). Police services, like the public sector in general, face heightened demands for efficiency

and transparency (Andersson and Tengblad 2009). Detrimental ways of organising work are found across occupational settings and are not unique to police work (Bliese et al. 2017; Pagon et al. 2011). Therefore, combining police-specific measurements with general measures of stress may be beneficial when applied to the police. Furthermore, such practice allows for the comparison of results across occupations, which is critical for developing the occupational stress research field (Evans and Coman 1993).

Adapting to the changing societal context of the contemporary world is a key driver in professionalising the police (Cockcroft 2020). This exceedingly complex process causes multiple reforms in police organisations worldwide. The changes have implied a growing need for competence, skills, and expertise (e.g., in social sciences, technology, or languages) that are not necessarily covered by ordinary police training and education (Bjørgo and Damen 2020). Additionally, with the emphasis on the competence needed to perform multiagency policing efforts, it is also anticipated that police services will increase their number of employees with other educational backgrounds, including at the police executive level.

Stressors change as areas of responsibility, roles, and tasks in the police are altered. As Brown et al. (1996) note, rank is an important variable, with staff in supervisory positions showing distinctive patterns of exposure and experience of stress compared to junior officers. Consequently, it is predicted that junior officers report higher levels of operational stress and lower levels of management organisational stress than senior staff. While some police employees perform their work tasks in highly polluted environments, in extreme heat, or in areas with dangerous animals (e.g., traffic police, environmental crime police, border police), other employees increasingly patrol and investigate, whether on or off the internet, highly emotionally demanding environments (e.g., online abuse of children, dating fraud, and domestic violence). The notable differences in the organisation of police work must be accounted for when interpreting the results of stress measurements among police. Models of police stressors should have some validity in terms of their capacity to discriminate meaningfully between groups of employees working in different contexts, with access to different resources, with different educational backgrounds, and in different departments in different parts of the world. With the use of police-specific measurements and assessment batteries in cooperation, police studies may reap benefits from both even though there may be considerable contextual differences.

How the Measurements Work

Psychometric properties in this scoping review were operationalised by reference to Cronbach's alpha. In this study, the measurements of Cronbach's alpha ranged from 0.16 to 0.97. A slight majority (54%) of the measures ($n = 70$) across the four categories had Cronbach's alpha values of approximately 0.80 or over. This fact indicates that, overall, they seem to work rather well. Furthermore, many of the observed differences they produce may be attributed to actual differences among individuals. Thus, 54% of the 129 measures seem to be consistent in their ability to reproduce similar results across time and space.

However, across the four categories, there were a few measures with low reliability scores (≤ 0.70). A low level of reliability indicates that the observed differences are contaminated by measurement error. Because measurements cannot be valid unless they are reliable, low reliability implies that these measures may not be equally effective at measuring a consistent difference in stress between individuals in the police. However, it should be noted that some of the measures may have been based on a formative scale development strategy (Diamantopoulos and Winklhofer 2001). If this is the case, Cronbach's alpha should not be used as a criterion for scale quality.

As shown in the tables, estimates of Cronbach's alpha scores differ. Reliability is not a fixed property (Keszei et al. 2010) but a function of the measurement, respondents, and circumstances under which a study is conducted. Before a measurement instrument can be used, its measurement properties, i.e., its reliability, validity, and responsiveness, should be assessed and found to be adequate.

Regardless of the assessment method, estimates of reliability should always be scrutinised for inaccuracies, as any chosen method entails biases. For example, known factors affecting the Cronbach's alpha score are its assumptions of uncorrelated errors, nonequal tau equivalence, normality, and unidimensionality (McNeish 2018).

Unidimensionality has to be verified prior to calculating Cronbach's alpha score. The reliability analysis may begin with an inspection of the factor structure. Scales that inadvertently investigate more than one construct are by definition not unidimensional and should not be measured by Cronbach's alpha. Factor loadings and latent variable modelling are increasingly common and may be warranted to measure tau equivalence and whether items vary jointly (DeVellis 2017). Usually, items in scales measure the same construct to different degrees of precision, which becomes visible through factor analysis. Furthermore, the circumstances under which the questionnaire is administered impact reliability and may cause uncorrelated errors where sources other than the construct being measured cause item responses to be related to another. While nonequal tau equivalence and normality of variable distributions cause Cronbach's alpha estimates that are too low, the uncorrelated errors affect estimates of Cronbach's alpha in unpredictable ways.

Cronbach's alpha is also dependent on scale length. Thus, irrespective of internal consistency, Cronbach's alpha will be high in scales consisting of more than approximately 15 items. In contrast, the shorter the scales, the more Cronbach's alpha reflects the correlations among the items included. Scales with a high Cronbach's alpha might be too interrelated and could indicate redundancy. New prerequisites and new findings or knowledge may change the reliability of measurements. Researchers investigating occupational stress have an imposed obligation to ensure realistic and recognisable wordings and expressions where the chosen stressors reflect the actual working context. Police-specific measurements have evolved in different parts of the world. As they reflect different work settings and conditions, modifications may be necessary before use.

Strengths and Limitations

This rigorous overview could not have been possible without a meticulous and systematic literature search. Through this search, the content and target of each measure, as well as the ways in which they operate in police settings, have been described.

A limitation of the scoping review, which may have hampered the conclusions and the recommendations drawn, is that studies in languages other than English were excluded. It is also important to note the need for awareness of the context surrounding the measures. Economic, cultural, political, and historical development affect society on both sides of the law, as do climate (Rasdi et al. 2017), geography (Ricciardelli 2018), police education (Bjørgo and Damen 2020), population, crime rate, and the number of police employees (Garcia et al. 2004). Thus, although the measures included in this scoping review are varied, they may be biased, as they predominantly portray the police in a minority of the world (e.g., Northern America and Europe). However, keeping these limitations in mind, this comprehensive review offers a representative view of measures of stress in the police.

Psychometric properties may be measured in several ways other than by Cronbach's alpha. With a broader scope of assessment, we could have included estimates of more measurements. First, single-item measurements do not provide Cronbach's alpha scores, and measurements without Cronbach's alpha scores may have been examined by other methods (e.g., by structural equation modelling, SEM, or McDonald's omega, ω). On the other hand, reliability differs as the populations and purposes of the study vary. That is, any measurement in the tables may work well and serve its purpose in the context in which it was used, independent of Cronbach's alpha indicated in the tables. Nevertheless, as Cronbach's alpha is a well-known and common way to establish rigour, it served the purpose of this scoping review, in which the aim was to gain a better overview of measurements and their psychometric properties.

Recommendations

Based on the findings in this scoping review, the following recommendations for conducting studies into stress among police are made.

First, depending on whether the aim of a study is to investigate stress among police across different categories, whether from a generic or a police-specific perspective, measures should be chosen to ensure alignment with theoretical assumptions, the aspect of the stress phenomenon the study aims to investigate, and sufficient psychometric properties.

Second, reliability scores should be evaluated before choosing a measure. In this study, a slight majority of measures had Cronbach's alpha values of approximately 0.80 or over. However, this information was not included in all the records we examined. Measurement should not be chosen based solely on reliability scores (e.g., Cronbach's alpha). We encourage all researchers to conduct reliability tests and interpret the score in light of known biases.

Third, if the aim is to investigate subjective stress experiences from a generic or a police-specific perspective, researchers and practitioners should apply one of the questionnaires that commonly ask respondents to rate the extent to which a situation or stressor is perceived (or not perceived) as stressful. These questionnaires may include police-specific measurements such as Daily Perceived Stress Level (Korre et al. 2014), 'Law Enforcement Critical Life Event Scale' (LECLES) (Coman et al. 1991b; Sewell 1983), 'Law Enforcement Officer Stress Survey' LEOSS (Can et al. 2015; Van Hasselt et al. 2008, 2003), 'Critical Incident History Questionnaire' (CIHQ) (Weiss et al. 2010), or 'Policing Event Scale' PES (Brown et al. 1999). Generic measurements could include 'Subjective Stress' (Motowidlo et al. 1986; Young 1994). Among assessment batteries, 'Work Stress Inventory' (WSI) (Barone et al. 1988), 'Occupational Stress Indicator', OSI (Evers et al. 2000; Robertson et al. 1990; Siu 2002), or the 'Job Stress Survey' (JSS) (Spielberger and Reheiser 1994) could be considered.

Fourth, if the aim is to detect the presence of different police stressors in the context of work stress and demands, police-specific measures such as the 'Police Daily Hassles Scale/Police Daily Uplift Scale', PDHS/PDUS (Hart et al. 1993; Kanner et al. 1981), and 'Occupational Stress Inventory', OSI (Dharmangadan 1988) might work well. Among generic measurements, we recommend 'Perceived Stress Scale', PSS-14 or PSS-10 (Cohen et al. 1983; Cohen and Williamson 1988; Graf 1986), 'Job Demands Resource Scale' (JDRS) (Rothmann et al. 2006), 'A Short Stress Evaluation Tool' (ASSET)

(Faragher et al. 2004; Johnson et al. 2005), or 'Demand/Control/Support Questionnaire' (DCS) (Garbarino et al. 2012; Sanne et al. 2005).

Fifth, studies that aim to investigate physiological complaints and ailments are encouraged to consider the 'Psychosomatic Complaints Scale of Stress', PSCSS (Greller and Parsons 1988, 1992), 'Lipp Stress Symptom Inventory', (L)SSI (Lipp 2009), or 'Medical Outcomes Study Short-Form Health Survey' (MOS-SF36) (Iwasaki et al. 2002).

Sixth, generic and police-specific measures recommended to address work distress and/or strain include 'Brief Symptom Inventory' (BSI) (Derogatis and Melisaratos 1983; Mearns and Mauch 1998), 'General Health Questions' (GHQ12/GHQ28) (Brown et al. 1999), 'Mental Health Professional Stress Scale' (MHPSS) (Cushway and Tyler 1996), or 'Kessler Psychological Distress Scale' (K10/KPDS) (Noblet et al. 2009). If choosing police-specific measurements, we recommend 'Police Work Experience Survey' (PWES) (Bishopp et al. 2018) or the 'Work Environment Inventory' (WEI) (Liberman et al. 2002).

Seventh, suggested operational and organisational stress measurements include 'Police Stress Questionnaire-Operational/Police Stress Questionnaire-Organizational', 'PSQ-Op/PSQ-Org' (McCreary et al. 2017; McCreary and Thompson 2006), 'Police stressors and felt stress inventory' (Brown and Campbell 1990), or 'Police Stress Questionnaire' PSQ (Biggam et al. 1997). These items all measure demands and stressors in the police setting. Relevant measures for studies concerning acute stress among police include 'Chronic and Episodic Stress' (Anson and Bloom 1988), 'Stress Appraisal Measure' SAM (Peacock and Wong 1990), 'Emotional Stress Reaction Questionnaire' ESRQ (Larsson et al. 1988), and the 'Acute Stress Response Scale' (ASRS) (Yang et al. 2011).

Implications

The main results from this scoping review show that there are a wide variety of existing measures applied to investigate stress among police. Most measures work well in the context in which they are used. It is recommended that measures be chosen based on the theoretical assumptions concerning stress as a phenomenon in the study in question as well as on the extent to which such measures suit the context and aims of the planned study. It is also advised that measures be chosen to develop both generic and police-specific knowledge. As there seems to be an emphasis on patrolling police work stressors in the context of police-specific stress measures, these stressors may profit from more alignment with the status of (on and offline) police work from several parts of the world to better measure the status quo. More research into stress among police, regardless of police employees' educational background, is also encouraged. More focus should also be devoted to the measurement of stress and wellbeing. Well-chosen measurements can improve the study of stress among police and thereby improve police work and the effect of policing on the societies that police protect and serve.

Appendix

Appendix search strategies

Ovid MEDLINE(R) ALL 1946 to June 21, 2019

Embase Classic + Embase (Ovid) 1947 to 2019 June 21

PsycINFO (Ovid) 1806 to June Week 3 2019

AMED (Allied and Complementary Medicine) (Ovid) 1985 to June 2019

Date searched: 23 June, 2019.

1	Police/ use medall	4821
2	exp police/ use emczd	12,188
3	Police Personnel/ use psyh	8880
4	(police* or policing or (law enforcement adj3 (personnel or officer* or official* or employ* or agen*))).ti,ab,tw,kw,kf,et	62,454
5	or/1–4	66,418
6	(exp Occupational Stress/ or Workload/) use medall	29,960
7	(exp job stress/ or workload/) use emczd	49,665
8	(exp occupational stress/ or Work Load/) use psyh	22,791
9	(Stress Psychological/ or Workload/) use amed	3077
10	(stress* or workload* or work load* or demand* or requirement* or strain or straining or strained or ((operational or organisational or organizational) adj3 (work or job or task* or duty or duties or activit* or factor*))).ti,ab,tw,kw,kf,et	4,146,872
11	or/6–10	4,185,494
12	5 and 11	8080
13	limit 12 to yr = "1806—2005"	2853
14	limit 12 to yr = "2006—2019"	5221
15	13 or 14	8074
16	12 not 15	6
17	remove duplicates from 13	2092
18	remove duplicates from 14	3546
19	16 or 17 or 18	5644

The Cochrane Library (Wiley)

Date searched: 23 June, 2019.

#1	MeSH descriptor: [Police] this term only	64
#2	(police* OR policing OR ((law NEXT enforcement) NEAR/3 (personnel OR officer* OR official* OR employ* OR agen*))):ti,ab,kw	601
#3	#1 OR #2	601
#4	MeSH descriptor: [Occupational Stress] explode all trees	255
#5	MeSH descriptor: [undefined] explode all trees	0
#6	((stress* OR workload* OR (work NEXT load*) OR demand* OR requirement* OR strain OR straining OR strained) OR ((operational OR organisational OR organizational) NEAR/3 (work OR job OR task* OR duty OR duties OR activit* OR factor*))):ti,ab,kw	95,970
#7	#4 OR #5 OR #6	96,039
#8	#3 AND #7	114
#9	#3 AND #7 in Cochrane Reviews, Cochrane Protocols	2
#10	#3 AND #7 in Trials	112

CINAHL (EBSCO)

Date searched: 23 June, 2019.

S1	MH "Police"	5,190
S2	(police* OR policing OR (law enforcement N2 (personnel OR officer* OR official* OR employ* OR agen*)))	9,432
S3	S1 OR S2	9,432
S4	MH "Stress, Occupational+" OR MH "Workload"	33,093
S5	((stress* OR workload* OR work load* OR demand* OR requirement* OR strain OR straining OR strained) OR ((operational OR organisational OR organizational) N2 (work OR job OR task* OR duty OR duties OR activit* OR factor*)))	340,123
S6	S4 OR S5	344,473
S7	S3 AND S6	1,032
S8	S3 AND S6—Exclude MEDLINE records	544

Academic Search Premier (EBSCO)

Criminal Justice Abstracts (EBSCO)

International Security & Counter Terrorism Reference Center (EBSCO)

Date searched: 4 July, 2019.

S1	MH «police»	33,328
S2	(police* OR policing OR (law enforcement N2 (personnel OR officer* OR official* OR employ* OR agen*)))	113,237
S3	S1 OR S2	113,237
S4	MH "Stress, Occupational+" OR MH "Workload"	6,841
S5	((stress* OR workload* OR work load* OR demand* OR requirement* OR strain OR straining OR strained) OR ((operational OR organisational OR organizational) N2 (work OR job OR task* OR duty OR duties OR activit* OR factor*)))	1,685,931
S6	S4 OR S5	1,685,931
S7	S3 AND S6	8,937

Scopus

Date searched: 15 July, 2019.

(TITLE-ABS-KEY ((police* OR policing OR ((law W/0 enforcement) W/2 (personnel OR officer* OR official* OR employ* OR agen*))))) AND (TITLE-ABS-KEY (((stress* OR workload* OR (work W/0 load*) OR demand* OR requirement* OR strain OR straining OR strained) OR ((operational OR organisational OR organizational) W/2 (work OR job OR task* OR duty OR duties OR activit* OR factor*))))).

Number of hits: 8179.

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Author contribution LR and BB planned the study and decided on search terms. HS and ATK conducted the systematic literature research and composed the appendix. LR, BB, KIF, and BL analysed and interpreted the data. LR was a major contributor in writing the manuscript and preparing figures and tables. All authors read and approved the final manuscript.

Availability of data and materials All data relevant for this study are included in this published article.

Declarations

Ethics approval Not applicable.

Competing interests The authors declare no competing interests.

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