Resilience Training Programs with Police Forces: A Systematic Review

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Abstract

Through the course of their career, it is expected that police officers are exposed to stressful and emotionally challenging environments, which, combined with well-known organizational and occupational stressors, makes this professional class vulnerable to several psychological and medical conditions. In recent years, there has been a growing interest in developing intervention programs that seek to minimize the impact of the changing nature of police work within a changing society and promote skills that enable police officers to deal more effectively with the current and future challenges. Therefore, the aim of this review is to systematize resilience training intervention programs and characterize their format, content, and efficacy. For that purpose, we searched four databases for resilience programs delivered to the police. We reached a final sample of 32 articles from a total of 550 published studies. The articles considered were divided into three main groups: mindfulness-based resilience interventions ($n = 13$), neurobiological-based resilience interventions ($n = 13$), and other resilience training interventions that did not fit in the previous categories ($n = 6$). There was much inter-intervention variability, mainly concerning their structure and approach. However, the intervention programs were relatively uniform in the topics covered, such as psychoeducation, police scenario simulation, and debriefing. Nonetheless, most studies found positive outcomes on the variables of interest, predominantly clinical and performance indicators (e.g., stress, anxiety, decision-making). Subsequent research endeavors could aim to determine the most reliable measure outcome measures for resilience variables and intervention efficacy, as alongside identifying pivotal occupational factors crucial to a robust and impactful resilience intervention.

Keywords Policing · Stress · Resilience · Intervention programs · Mindfulness · Neurobiological measures · Well-being

Introduction

In a world affected by the COVID-19 pandemic, socioeconomic instability, and major public health emergencies, the concern of clinicians and the research community regarding the negative impact of these events on the mental health of the workforce has been increasing. Among the workforce, police are a professional group that faces constant unpredictable and stressful situations, making police officers vulnerable to mental health issues, such as burnout, anxiety, depressive symptoms, and posttraumatic stress. This has been translated to a growing interest in the scientific community to characterize and alleviate the impact of well-known stressors specific to this occupation (Craddock and Telesco 2022; Syed et al. 2020;

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Violanti 2010; Violanti et al. 2017). Moreover, this exposure has been linked in the minority to high-risk alcohol consumption, substance abuse, and other maladaptive coping behaviors through its impact on physical and emotional exhaustion, organizational stressors, and work-family conflict (Civilotti et al. 2021; Kaplan et al. 2020; Mojallal et al. 2022; Rehder et al. 2021; Syed et al. 2020; Violanti et al. 2017; Werner-de-Sondberg et al. 2021). Despite being a minority, the consequences in mental health and general well-being are significant, which should not minimize the clinical and scientific efforts to implement suitable solutions. Consequently, practitioners and researchers have increasingly been prioritizing studies intending to foster psychological resilience, particularly for those in high-stress occupations, such as police officers (Chitra and Karunanidhi 2021; Craddock and Telesco 2022; Michela et al. 2022; Trombka et al. 2021). Thus, the aim of the present review is to systematize the included papers focused on resilience training interventions, and characterize them both in intervention format and structure, content covered and methods, as well as their efficacy.

Resilience Training Programs in Law Enforcement Settings

Resilience is the ability to employ internal and external resources to face and recover from adversity successfully and is based on three main factors: personal traits, social support, and coping tendencies (American Psychological Association, 2022). Even though this is universally accepted in the current literature, there has been some discussion, especially in the intervention literature, on what resilience involves and how it should be operationalized (Wild et al. 2020). Regarding this topic, two important issues should be addressed: (i) the distinction between the concepts of resilience and coping, which are intrinsically correlated but often conflated, since coping behavior is part of the resilience umbrella but not a substitute for that, and (ii) consideration of meta-emotional and meta-cognitive processes in the study of the stress resilience link, as continued exposure to aversive events may manifest in maladaptive cognitive-affective-behavior patterns, concerning which cognitive reappraisal, flexibility, self-awareness, and other meta-cognition processes can play a fundamental role (Fletcher and Sarkar 2013; Matthews et al. 2019; Palamarchuk and Vaillancourt 2021).

Since resilience is considered essential to well-being and mental health, there has been growing interest from clinicians and researchers in developing initiatives to promote psychological hardiness when facing life-challenging situations and enhancing mental and physical well-being. Thus, resilience training programs (RTPs) have become popular, particularly within higher-stress jobs, such as first responders and emergency services (Brassington

and Lomas 2020; Canady et al. 2021). In contrast to their popularity, the literature on the efficacy of RTPs has been inconsistent. While some studies have found medium to large effects on resilience improvements (Arnetz et al. 2013; Chitra and Karunanidhi 2021; Khatib et al. 2022; Trombka et al. 2021), many have also failed to find significant results (Di Nota et al. 2021; Ribeiro et al. 2020; van der Meulen et al. 2018). Moreover, the definition and structure of successful RTPs are still unclear and inconsistent (IJntema et al. 2019). Within resilience-focused interventions, cognitive-behavioral models are the most common, providing the backbone of resilience training: psychoeducation, cognitive and emotional reappraisal, exposure to stressors, role-playing, breathing techniques, and debriefing (e.g., Au et al. 2019; Carleton et al. 2018; Chitra and Karunanidhi 2021; Romosiou et al. 2019). Training guidelines for high-risk professionals recommend including appraisal and meta-reflective strategies as critical (Fletcher and Sarkar 2013; Matthews et al. 2019), along with situational awareness and physiological indices of affective and cognitive processes (O'Hare and Beer 2018).

Among the available RTPs, Mindfullness-Based Resilience Training (MBRT) has acquired great interest from the scientific and clinical community. MBRT is a mindfulness-based intervention explicitly tailored to high-stress occupations and stems from mindfulness-based stress reduction programs (MBSR; Kabat-Zinn 2017). MBRT consists of 10 sessions over 8 weeks, including hatha yoga training, psychoeducation, and practical mindfulness exercises on perception, stress, and communication (Kabat-Zinn 2017). Although mindfulness-based interventions were not initially developed specifically with and for high-risk occupations, their results have proven effectiveness and usefulness for these occupations, and are especially popular in the police (e.g., Canady et al. 2021; Márquez et al. 2020; Rehder et al. 2021; Trombka et al. 2021). Accordingly, MBRT follows the same intervention format, adapting its content to specific police demands, with the aim of enhancing physiological and psychological resilience (e.g., Bergman et al. 2016). Overall, the methods used are similar to MBSR, specifically psychoeducation, breathing control and meditation techniques, cognitive diffusion, situational awareness, emotional regulation, and coping with specific police challenges (Arble et al. 2017; Christopher et al. 2016; Hunsinger et al. 2019; Kaplan et al. 2017; Ribeiro et al. 2020). MBRT programs have shown significant results among officers and outcomes specific to stress, depression, anxiety, burnout, and alcohol consumption (Grupe et al. 2021a; Khatib et al. 2022; Navarrete et al. 2022; Rehder et al. 2021; Trombka et al. 2021). Overall, these MBRT programs have shown promising results in decreasing psychopathology and promoting more adaptive coping strategies in police settings.

Another primary type of intervention focused on building resilience involves training programs that include biofeedback and neurofeedback as part of the training. These are commonly combined with objective outcome measures, such as biomarkers, physiological and brain measures, and psychological variables, such as depression and anxiety symptoms, sleep problems, and perceived stress. These will be referred to as neurobiological-based resilience training (NB-BRT). Some of the main reasons underlying the interest in this type of physiological measure are the relative lack of stress reactivity awareness among officers (e.g., Ramey et al. 2016) and findings of higher physiological stress related to emotionally challenging situations (e.g., Micaella et al. 2022). Additionally, a study was developed by Anderson and colleagues (2015) on decision-making regarding firearm use. By promoting higher physiological awareness, officers can regulate their own stress reactivity more efficiently and thus adopt more adaptive coping behaviors when facing adverse events. In this process, psychophysiological coherence assumes a central role. This concept reflects efficient body functioning and optimal synchronization of central and autonomic nervous systems, which indicates increased emotional stability, cognitive and emotional flexibility, and, consequently, resilience (McCraty et al. 2006). Within NB-BRT programs, there is vast heterogeneity not only in terms of measures used to evaluate their effectiveness but also in the format and content of the interventions. Nonetheless, they are all grounded in principles of stress awareness and reactivity, cognitive and behavioral training, self-regulation, and realistic scenario simulation (Andersen and Gustafsberg 2016; Arnetz et al. 2013; McCraty and Atkinson 2012; Page et al. 2016). Most NB-BRT programs use biofeedback, primarily resorting to cardiovascular measures and heart rate variability (HRV) as the primary outcome (Andersen and Gustafsberg 2016; Michela et al. 2022; Ramey et al. 2017; Weltman et al. 2014). Others have used additional physical measures, with cortisol being the second most used in resilience training (e.g., Andersen et al. 2016; Arnetz et al. 2009).

Notwithstanding the relevance of resilience interventions, one of the main critiques points to the majority of RTP showing conflicting efficacy results in improving mental health outcomes. Part of this shortcoming is due to the lack of standard and structured guidelines on what an intervention program must include to be considered a resilience training program (IJntema et al. 2019; Leppin et al. 2014; Wild et al. 2020). The available systematic reviews on the efficacy of resilience training programs have either focused on resilience programs in general and irrespective of the target population (Joyce et al. 2018; Leppin et al. 2014) or have focused on high-stress or emergency occupations but omitted the police (e.g., Brassington and Lomas 2020). These authors use different definitions and inclusion criteria for resilience training, namely "preventive intervention tailored for first responder

to reduce negative health outcomes" (Kaplan et al. 2017, p. 1373) and "multiday program of intensive resilience and tactical training in improving cortisol responses to stressful situations" (Andersen et al. 2016, p. 1). These few examples, although seamlessly focusing on coping mechanisms toward stressors and psychological constructs related to well-being, which depict the resilience concept, reflect some heterogeneity and refer to one of the main criticisms of the field: the lack of consensus on the content and definition of a solid, structured, and efficient resilience program. For this paper, we will consider resilience programs that provide training regarding self-regulation and coping mechanisms to deal with challenging situations, namely those particular to police context, with the aim of improving police well-being. In line with McCraty and Atkinson (2012), these interventions should include stress management skills training to not only develop psychological hardiness and emotional self-management to recover after meeting acute stressors, but also to improve adaptation to chronic stressors present in their lives, either emergent from organizational or personal contexts. Likewise, there is still a long way to go concerning a standardized golden instrument that assesses resilience as one construct. Nevertheless, according to a review conducted by Joyce and colleagues (2018), three main instruments have been validated and used to assess the ability to adapt and cope efficiently with life adverse events: (i) the Brief Resilience Scale (BRS, Smith et al. 2008); (ii) the Connor and Davidson Resilience Scale (Connor and Davidson 2003); and (iii) the 14-item Resilience Scale (Wagnild 2009).

Therefore, we aim to systematize the available evidence on resilience training intervention, specifically with officers given police organizational and job characteristics. To our knowledge, there is no systematic review of resilience training with this specific population thus far. We are interested in understanding how resilience training programs can foster police well-being, mental health, and performance, with emphasis on stress outcomes, as this is distinctive of these professionals' work. Hence, our research questions are threefold: Thus far, what kind of resilience training programs have been developed with the police population? What characteristics are shared across this type of intervention? Is there a specific intervention outcome measure that should be used when measuring resilience?

Methods

We conducted a study of the reflective systematic literature review, for which we considered resilience training programs any intervention (individual or group) focused on fostering mental health and psychological well-being, including coping and emotional regulation training, and with an impact on objective measures of mental health-related outcomes

(e.g., well-being, depression, anxiety, stress). Concerning the sample, we only considered programs developed for active duty police officers. No eligibility restrictions were applied in terms of format, method and/or content used in the intervention. However, we did not consider clinically focused interventions (e.g., posttraumatic stress or suicide interventions), resilience training that did not assess the intervention effectiveness using instruments or objective measures of its efficacy, and studies based only on qualitative methods. We opted to exclude these studies as they were focused exclusively on the exploration of the police perception of the delivered training without any additional measures, which provides valuable information from the participants' point of view but does not provide much information on its effectiveness. We did not place restrictions on the nature of the target outcome measures, as we aimed to understand the overall impact of resilience training on both resilience and broader health outcomes.

Search Strategy

The present systematic review was conducted in accordance with preferred reporting items for systematic reviews and meta-analysis (PRISMA-P) (Page et al. 2021) and PRISMA specific guidelines on healthcare interventions (Liberati et al. 2009).

Between November 2022 and December 2022, the following databases were accessed: Scopus, Web of Science, PubMed, and PsychArticles (EBSCO). Two peer reviewers (AM, PB) searched for published articles that focused on resilience training carried out with police. Other synonyms were added as "law enforcement" and "security forces" to include as many reports as possible on the theme ((*"resilience training" and ("police*" or "law enforcement" or "security forces"))*. In all databases, keywords were broadened to "all fields." The search was restricted to peer-reviewed published scientific articles and excluded books, book chapters, and grey literature. Only papers written in English, Portuguese, and Spanish were considered due to the reviewers' proficiency in these languages. No restrictions were applied in terms of the year of publication due to the relative recency of the studies. Also, no restrictions were applied as well in terms of nationality, as we wanted to include as many intervention programs fostered with police forces as we could, considering the place, nationality or ethnicity did not pose any relevance for the present study.

Study Selection

The present review initially identified a total of 550 published studies (Fig. 1). After duplicates were removed, the
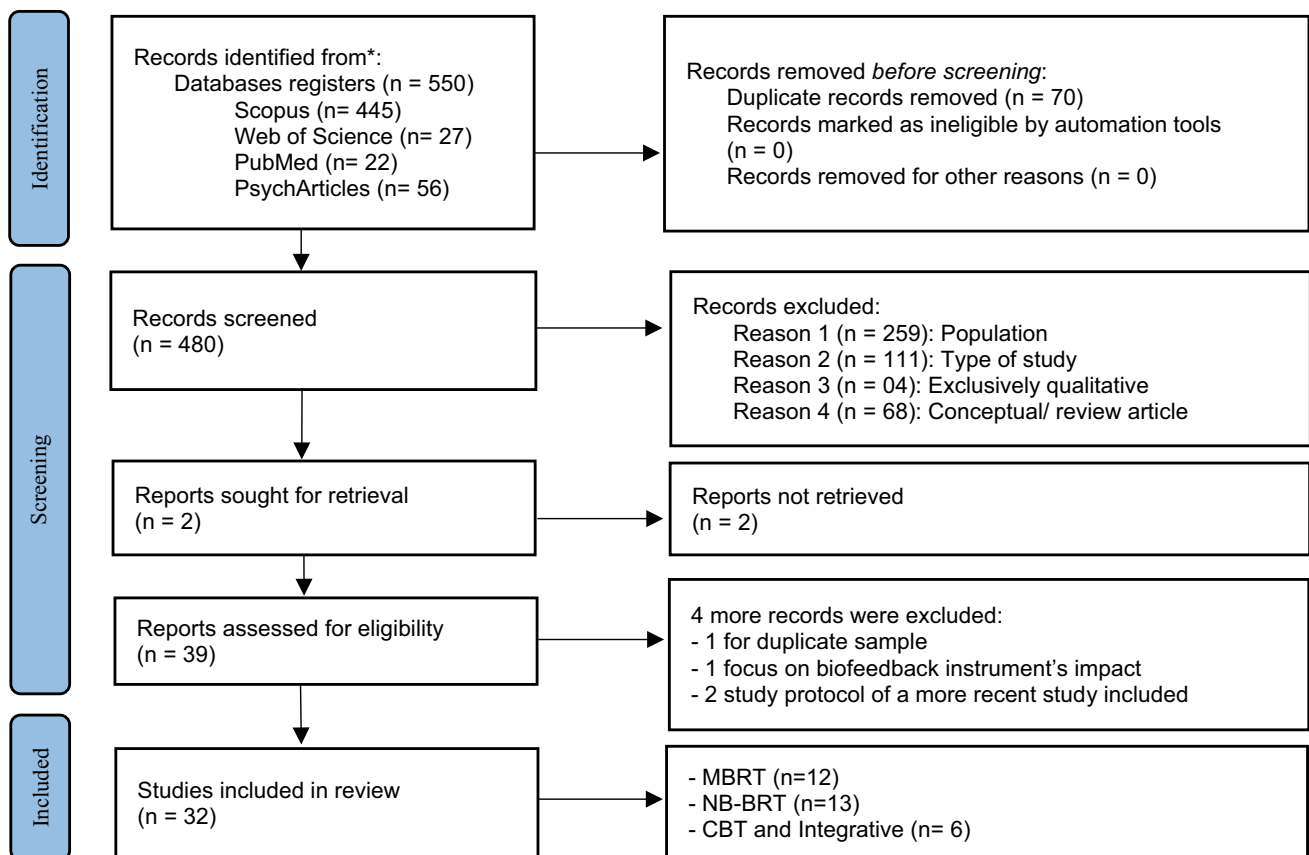

Fig. 1 Flow diagram with the selected studies respecting stress resilience programs with the police

reviewers screened the abstracts of a total of 480 studies. The main reasons for exclusion were (i) articles that did not include police samples or did not specify police samples among broader samples (a total of 259 papers); (ii) the type of study, i.e., studies that included police but did not include a form of resilience training, for example, a study focused on the correlation of variables (a total of 110 papers); (iii) exclusively qualitative focused papers (a total of 4 papers); and (iv) conceptual articles, including systematic reviews, meta-analyses, overviews, and reviews of concepts (a total of 68 papers). If the abstract did not sufficiently report the aims of the study and whether an intervention was undertaken, the full article was then retrieved and included for the second phase of screening. Only 33 articles were eligible based on our inclusion and exclusion criteria. Finally, four additional papers were excluded after discussion: one duplicated a sample that was part of a larger sample published in another article that was already included in our review, one focused on the impact of a biofeedback portable instrument that did not include structured training, and two were the study protocol of a more recent study that was already included in our review. Articles where consensus was not reached were then discussed until consensus on inclusion or exclusion was reached. There was no need for an arbitrator. A total of 32 studies were included in the review.

Data Extraction

After establishing data extraction coding, the two peer reviewers (AM, PB) independently extracted the information on author/s, publication year, country, total sample number, sociodemographic variables (gender, mean age, years of service), identification of whether the training followed a randomized control trial design (RCT), format of intervention, theoretical basis and content of intervention, instruments used for outcome measures, and main findings. This data was exported to a common Excel file, containing information and procedures concerning all databases and steps taken within the review. Data is available upon request from authors.

Intervention Categorization

During the review process, it was clear that resilience training programs are based on various conceptual bases, and are of various intervention formats, duration, and target outcomes. They also have varying success rates. After analyzing all eligible articles, we found three main categories of resilience training programs, which correspond to those discussed in the introduction section: (1) MBRT—resilience intervention programs based on mindfulness approaches, (2)

NB-BRT—resilience and stress resilience programs resorting to neurobiological processes, either as part of the training or as an outcome measure, and (3) other CBT and integrative resilience programs that did not fall under either of these previous categories.

Results

From the 550 published studies, only a final sample of 32 papers was retrieved. After reviewing the papers in full, RTPs were divided into three main groups according to their broad content: (i) mindfulness-based resilience programs (MBRT); (ii) resilience training programs based on neurobiological processes; (iii) other CBT-based and other integrative RTPs. Regarding the first, we found 13 training programs that were fairly homogenous in their training delivery and theoretical basis. Regarding the second group, we found 13 papers moderately diverse in their training format, instruments, and outcome measures but also relatively homogenous in the techniques applied throughout the training delivery. Finally, we found 6 CBT and other resilience training programs, which were based primarily on CBT techniques and/or drew from other approaches, such as the person-centered approach, positive psychology, sports performance, and mindfulness. These three groups of RTPs are presented separately to simplify the discussion (see Table 2, 3, and 4, respectively). Table 1 below offers an outline of the main general characteristics of the resilience training included.

Mindfulness-Based Resilience Interventions (MBRT)

As Table 2 shows, this subgroup is composed of 13 recent studies. Although no time frame was applied, the first study was published only in 2016. The vast majority are from the USA (69.2%), followed by Spain (15.4%), and only one study each from the Netherlands (7.7%) and Brazil (7.7%). Of the 13 studies in this group, six adopted an RCT study design (38.5%), and seven adopted a nonrandomized, mostly pre- post-test study design (61.5%). The sample sizes range from 20 to 170 participants, with an average of 66.6 ($SD = 39.7$). Most programs followed a format of 8 weeks with 2-h sessions per week and a 6-h session on the 7th week, and two offered a more condensed 6-week program with 2-h sessions per week.

Regarding the theoretical foundations, most followed an MBRT program adapted to officers' reality. In contrast, only one did not follow the MBRT proposed by Kabat-Zinn (2017) but was still based on a similar mindfulness-based intervention. One study opted to randomize its participants

Table 1 General characteristics of RTPs

	General (*N*=32)	MBRT (*n*=13)	NB-BRT (*n*=13)	CBT and other RTP (*n*=6)
Country	USA, 50% (*n*=16) Netherlands, 9.3% (*n*=3) Finland, 9.3% (*n*=3) Spain, 6.25% (*n*=2) Sweden, 6.25% (*n*=2) Canada, 6.25% (*n*=2) Brazil, 3.1% (*n*=1) Greece, 3.1% (*n*=1) China, 3.1% (*n*=1) India, 3.1% (*n*=1)	USA, 69.2% (*n*=9) Spain, 15.4% (*n*=2) Netherlands, 7.7% (*n*=1) Brazil, 7.7% (*n*=1)	USA, 46.2% (*n*=6) Finland, 23.1% (*n*=3) Sweden, 15.4% (*n*=2) Netherlands, 7.7% (*n*=1) Canada, 7.7% (*n*=1)	USA, 16.67% (*n*=1) Netherlands, 16.67% (*n*=1) Canada, 16.67% (*n*=1) Greece, 16.67% (*n*=1) China, 16.67% (*n*=1) India, 16.67% (*n*=1)
RCT vs. pre-post-test studies	31.3% vs. 68.8% (RCT, *n*=10) (Non RCT, *n*=19)	38.5% vs. 61.5% (RCT, *n*=5) (Non RCT, *n*=8)	30,8% vs. 69.2% (RCT, *n*=4) (Non RCT, *n*=9)	16.7% vs. 83.3% (RCT, *n*=1) (Non RCT, *n*=5)
Sample size (mean and SD)	*M*=72.8 (±*SD*=74.6)	*M*=66.6 (±*SD*=39.7)	*M*=43.5 (±*SD*=48.7)	*M*=149.5 (±*SD*=124.9)

into three different mindfulness-based approaches, which showed no significant differences between groups, notwithstanding the positive outcomes in all three.

Concerning the instruments and target outcome measures used, the studies are highly diverse. Nine of the MBRT programs used the Five Facet Mindfulness Process Questionnaire (FFMQ; Baer et al. 2006), six used a general health scale, fewer than half (*n*=6) used a specific stress scale for the police (e.g., PSQ; McCreary and Thompson 2006), and/or a general perceived stress scale (PSS; Cohen and Williamson 1988), and only three of them used a direct measure of resilience (BRS; Smith et al. 2008). Other less common measures used included burnout, depression and anxiety, self-regulation and sleep quality inventories, as well as physiological measures of stress (i.e., cortisol). Regarding the intervention effectiveness, the results were positive overall despite some inconsistencies. While over half found moderate to significant improvement in mental health outcomes, such as burnout and stress, some found weak or inconsistent effects, i.e., positive results in some outcomes but no improvements in others.

Neurobiological-Based Resilience Interventions (NB-BRT)

Regarding NB-BRT programs represented in Table 3, this group comprises thirteen studies, and the first study goes back to 2009. This group has various country settings, divided between the USA (46.2%), Finland (23.1%), Sweden (15.4%), Canada (7.7%), and the Netherlands (7.7%). Just under half of the studies (30.8%) followed an RCT study design, while the rest followed a nonrandomized, mostly pre- post-test study design (69.2%). The sample sizes ranged from 9 to 187 participants, with an average of 43

(*SD*=48.67). The length of the interventions ranged from a 1-single day to a 10-session program spread over weeks. A specific study of this group delivered 2 sessions of psychoeducation followed by 3 months of field practice. Only one study focused on neurofeedback, but did not specify the length of the intervention, which was flexibly adapted to the needs of each of the study participants.

Most of the studies contained in this group followed an experimental design. Relatively to the theoretical approach, some identified their theoretical foundations explicitly such as the following: stress resilience training, autonomic modulation intervention, emotional regulation using breathing-based virtual reality, and mixed approaches. Four studies reported that they developed their intervention programs, specifically: (1) police trauma resilience training based on stress performance and coping enhancement training; (2) the Coherence Advantage Program focused on building resilience, reducing operational stress, and developing optimal physiological functioning; (3) a structured training program based on empirical research on dynamic police training; and (4) pilot resilience training based on methodology applied in the military, using psychoeducation on stress, biofeedback, and decision-making. The remainder of the programs combined typical methods and techniques used in psychology models, namely, CBT, such as psychoeducation, stress and situational awareness, emotional-regulation and decision-making skills training and biofeedback, using realistic scenario simulation practice, most of which were also used in the previously mentioned studies. Finally, one unique study used a brain activity synchronization program based on closed-loop non-invasive therapies utilizing real-time monitoring.

The battery of instruments and other target outcome measures were diverse, and either self-report or biological

Table 2 MBRT program characteristics, content, and main findings

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Christopher et al. (2016)	USA	N = 62 Sd: Gender (G) 64% male (M) and 36% female (F) Mean age (A): M = 43.76 (±SD = 7.22) Average years of service (S): M = 13.72 (±SD = 5.96)	No	8-weekly 2 h session, and 6 h on 7th session -3 cohorts	Mindfulness-Based Resilience Training (MBRT), based on Mindfulness-Based Stress Reduction (MBSR): -Meditation practices, transactional model of stress, and mind–body connection	Physical Measure (PM): Cortisol Self-report: Five Facet Mindfulness Questionnaire (FFMQ); Mindfulness Process Questionnaire (MPQ); Brief Resilience Scale (BRS); Patient Reported Outcomes Measurement Information System (PROMIS®); Perceived Stress Scale-4 (PSS-4); Police Stress Questionnaire (PSQ); Oldenburg Burnout Inventory (OLBI); Emotional Intelligence Scale (EIS); Difficulties in Emotion Regulation Scale (DERS); Family Assessment Device (FAD)	- Improvement of mental and physical health outcomes, such as stress, sleep, burnout, anger, and emotional intelligence - No significant impact on family functioning
Bergman et al. (2016)	USA	N = 47 Sd: G, 64% M and 36% F A: M = 42.75 (±SD = 7.25) S: M = 13.83 (±SD = 7.52)	No	8-weekly 2 h session, and 6 h on 7th session -3 cohorts	MBRT, based on MBSR: - Typical content of MBSR, individualized and based on the specific police problems	Self-report: FFMQ; PROMIS®; PSQ	- Preliminary efficacy in reducing stress and anger
Kaplan et al. (2017)	USA	N = 47 Sd: G, 57% M and 43% F A: M = 43.53 (±SD = 7.72) S: M = 13.58 (±SD = 5.94)	No	8-weekly 2 h session, and 6 h on 7th session	MBRT, based on MBSR: - Experiential and didactic exercises (body scan, sitting and walking meditations, and other MBSR practices)	Self-report: FFMQ-SF; BRS; Oldenburg Burnout Inventory (OLBI)	- Changes in resilience partially mediated the relationship between mindfulness and burnout, and that increased mindfulness was related to increased resilience. This was related to decreased burnout. Evidence for mediation

Table 2 (continued)

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Christopher et al. (2018)	USA	N=61 Intervention group (n=31) Sd: G, 90% M and 10% F A: M=44.73 (±SD=6.63) S: M=18.50 (±SD=6.98) Control group (n=30) Sd: 90% M and 10% F A: M=43.22 (±SD=5.43) S: M=17.97 (±SD=6.69)	Yes	8-weekly 2 h session, and 6 h on 7th session	MBRT, based on MBSR - Experiential and didactic exercises (body scan, sitting and walking meditations, and group discussion)	PM: Cortisol Self-report: Expectancy/Credibility Questionnaire (E/CQ); PROMIS® (v1.0) short form; Concise Health Risk Tracking scale (CHRT); PSQ; OLBI; FFMQ-SF; Acceptance and Action Questionnaire–II (AAQ-II); Self-Compassion Scale-Short Form (SCS-SF); Connor-Davidson Resilience Scale (CD-RISC); Buss-Perry Aggression Questionnaire-Short Form (BPAQ-SF); iMINDr app	- Outcome data suggest MBRT targets key physiological, psychological, and health risk factors in LEO (Significant differences in MBRT group in cortisol, aggression, organizational stress, burnout, sleep, and psychological flexibility); - No significant improvement in resilience and self-compassion; and no differences comparing to control in the follow-up
Hunsinger et al. (2019)	USA	N=61 Intervention group (n=31) Control group (n=30) Sd: A: M=43.97 (±SD=6.03) S: M=18.23 (±SD=6.83)	Yes	8-weekly 2 h session, 3-month follow-up	MBRT, based on MBSR - Didactic exercises centering on stress and resilience, and mindfulness practices such as body scans, seated meditation, walking meditation, and mindful movement, followed by group discussion	Self-report: FFMQ-SF; iMINDr app Behavioral task: Shooter Bias Task (SBT)	- Results do not provide evidence for the impact of MBRT on weapon identification but suggest that LEO exerted more effort when responding to images of Black males compared to White males
Ribeiro et al. (2020)	USA	N=24 Intervention group (n=24) Sd: G, 92% M and 8% F A: M=43.2 (±SD=5.26) S: M=18.5 (±SD=6.98) Waiting List Control group (n=26)	Yes	8-weekly 2 h sessions. and 6 h on 7th session	MBRT, based on preliminary study (Christopher et al. 2018) - Experiential and didactic exercises (e.g., body scan, meditation, mindful movement, and group discussion)	Self-report: BPAQ-SF; iMINDr app	- Home-based MBRT practices for LEOs, even at low rates of adherence, may reduce aggression

Table 2 (continued)

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Márquez et al. (2020)	Spain	N = 20 Sd: G, 45% M and 55% F A: M = 45.63; (± SD = 10.17)	No	6-weekly 2 h sessions, and 4 h on 7th session	Mindfulness-Based Stress Reduction (MBSR) - Conscious movements, breathing meditation, observation of bodily sensations, emotions and thoughts, and several group exercises	Self-report: FFMQ; SCS; Professional Quality of Life Scale (ProQOL); Perceived stress scale (PSS) Qualitative evaluation on training content	- Significant differences in mindfulness, compassion satisfaction and perceived stress levels after intervention - No significant improvements observed for the remaining variables
Hoeve et al. (2021)	Netherlands	N = 82 Sd: G: 43.9% M and 56.1% F A: M = 49.0; (± SD = 8.4) S: 51.2% worked for over 20 years, 37.8% worked over 10 years, 11% worked less than 10 years	No	6 weekly, 2-h, and 6/7- week follow-up	Adapted from Williams and Cullen (2013): - Adaptation to the work situation of police officers; Exercises comprised: body scan, sitting meditation, object meditation, walking meditation, seeing meditation, sounds and thought meditation, befriending meditation, 3-min breathing space, and mindful yoga	Self-report: Depression, Anxiety and Stress Scale (DASS-21); subscale of the Four-Dimensional Symptom Questionnaire (4DSQ); PSQ-Op; Impact of Event Scale (IES); BRS; sleep difficulties subscale from Symptom Vcheck-list-90-Revised (SCL-90); Positive and Negative Affect Scale (PANAS); FFMQ- Short Form; Attentional Control Scale (ACS); SCS-Short Form	- Significant improvement on stress (primary outcome), facets of mindful awareness (explanatory variables—acting with awareness, nonjudging), and related secondary outcomes including somatic complaints, sleep disturbances, positive affect, happiness, and work ability - Effects remained significant or improved further during the follow-up period
Trombka et al. (2021)	Brazil	N = 170 Intervention group (n = 88) Sd: G, 28.3% M and 74.7% F A: M = 42.07 (± SD = 7.53) Waitlist control group (n = 82) Sd: G, 22% M and 78% F A: M = 42.46 (± SD = 7.95)	Yes	8-weekly 2 h sessions, 6-month follow-up - 2 cohorts: Porto Alegre and São Paulo	Mindfulness-Based Health Promotion (MBHP), core based on MBSR, and Mindfulness-Based Cognitive Therapy (MBCT) - Informal mindfulness practices, such as walking, eating, exercising, talking, and doing housework; Concepts of radical acceptance, values clarification, and positive psychology; psychoeducation and practical exercises	Self-report: World Health Organization Quality of Life-BREF (WHOQOL-BREF); Mindful Attention Awareness Scale (MAAS); SCS; Hospital Anxiety and Depression Scale (HADS); Duke University Religion Index (DUREL)	- MBHP group exhibited greater improvements in quality of life, depression, and anxiety symptoms at post-intervention and follow-up, and increasing non-organizational religiosity at post-intervention - Changes on self-compassion mediated the relationship between group and pre to post changes for all QoL domains and facets. Group effect on QoL overall health at post-intervention was moderated by mindfulness trait and spirituality changes

Table 2 (continued)

Author and year	Country and police setting	Participants (sample size— N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Grupe et al. (2021a)	USA	$N = 30$ -2 cohorts ($n = 15$) Sd: no characterization of the sample	No	8-weekly 2 h sessions, 5-month follow-up -2 cohorts	Mindfulness intervention based on MBSR and MBRT Classes included (1) didactic instruction (mindfulness, stress, emotions, and mindfulness efficacy); (2) practices including breath and body mindfulness, body scan, mindful movement, mindfulness of thoughts and emotions, and other mindful techniques; and (3) inquiry in dyads, triads, or full group on participants' experiences	PM: skin conductance, respiratory rate, heart rate; other Self-report: PSQ; PSS; OLBI; Pittsburgh Sleep Quality Inventory (PSQI); PTSD Checklist—Civilian Version (PCL-C); PROMIS® (43-item version); Work Limitations Questionnaire—Short Form (WLQ-8); Psychological Well-Being Scale (PWB); PANAS; Critical Incident History Questionnaire (CIHQ); semi-structured interviews Behavioral tasks: go-nogo task and Breath Count task	- Reduced post-training perceived stress, sleep disturbances, anxiety, and burnout. Additionally, novel evidence identified for reduced PTSD symptoms that persisted at a 5-month follow-up assessment
Grupe et al. (2021b)	USA	$N = 114$ Intervention group ($n = 57$) Sd: G, 60% M and 40% F A: $M = 39.8$ ($\pm SD = 9.3$) S: $M = 14.3$ ($\pm SD = 8.3$) Waitlist control group ($n = 57$) Sd: G, 60% M and 40% F A: $M = 40.2$ ($\pm SD = 7.4$) S: $M = 13.8$ ($\pm SD = 7.9$)	Yes	8-weekly 2 h sessions, 4 h extended 7th class, 3-month follow-up - 2 cohorts	Modified from a previous feasibility pilot study (Grupe et al. 2021a), MBSR and MBRT: - Didactic instruction around principles of mindfulness, stress, emotions, and mindfulness efficacy; embodied practices, including mindfulness of the breath and body, a body scan, walking meditation, and other mindful techniques; and inquiry in dyads, triads, or the full group about participants' experiences in practice	Physical measures: skin conductance, respiratory rate, heart rate; salivary and hair cortisol, and blood-based inflammatory markers Self- report: Organizational and Operational Police Stress Questionnaire (OOPSQ); PSS; PTSD Checklist for DSM-5; PROMIS; PSQI; Alcohol Use Disorders Identification Test (AUDIT); OLBI; Health Behaviors Checklist (HBC); Work Limitations Questionnaire Behavioral tasks: mnemonic similarity task and go/nogo task	- The mindfulness group had greater improvements in psychological distress, mental health symptoms, and sleep quality post-training, and follow-up. Intervention participants also had a significantly lower cortisol awakening response at 3-month follow-up relative to waitlist control - Contrary to hypotheses, there were no intervention effects on hair cortisol, diurnal cortisol slope, or inflammatory markers

Table 2 (continued)

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Navarrete et al. (2022)	Spain	N = 38 Intervention group (n = 20) Sd: G, 60% M and 40%F A: M = 39 (±SD = 6.23) Waitlist control group, n = 18 Sd: G, 61% M and 39%F A: M = 41.06 (±SD = 6.60)	No	8-weekly 2 h session, follow-up (time non-specified)	Mindfulness-Based Intervention, based on Hölzel and colleagues (2011) model of mindfulness mechanism: - Proposes attention regulation, body awareness, emotion regulation, and changes in the perspective of the self as components through which mindfulness meditation works	Self-report: Discrete Emotions Questionnaire (DEQ); FFMQ-Short Form; SCS-Short Form; Depression, Anxiety, and Stress Scale (DASS-21); PROMIS- Sleep Disturbance; Copenhagen Burnout Inventory (CBI); Difficulties in Emotion Regulation Scale-Short Form (DERS-SF); Frequency of Suicidal Ideation Inventory (FSII)	- High acceptance and attendance rates. Significant positive differences in MBI group in mindfulness, self-compassion, depression, anxiety, stress, emotion regulation, sleep, and burnout. MBI police officers experienced decrease of anger, disgust, anxiety, sadness, and desire - Significant between-group differences were found in the way of attending to internal and external experiences, depression symptoms, general distress, and burnout
Khatib et al. (2022)	USA	N = 84 Final sample intervention: N = 50 Sd: G, 68% M and 32%F A: M = 44; (±SD = n.d.) MBSR (n = 14) MBRT(n = 17) mPEAK (n = 19)	No	8-week, 2.5 h weekly classes held via Zoom	Feasibility and efficacy of three standardized, mindfulness-based interventions: MBSR, MBRT, and Mindful Performance Enhancement, Awareness, and Knowledge (mPEAK)	Self-report: Aggression Questionnaire (AGQ); PSS; Beck Depression Inventory-II (BDI-II); DERS; State Anxiety Inventory (STAI); FFMQ	-No significant outcome differences between groups. Significant decreases in aggression, stress, depression, difficulties in emotion regulation, and anxiety - Increases in dispositional mindfulness mediated the relationship between aggression and stress and depression. Mindfulness training may produce improvements in well-being in a sample of highly stressed police officers

Table 3 NB-BRT characteristics, content, and main findings

Author and year	Country and police Setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Arnetz et al. (2009)	Sweden	$N=18$ Intervention group ($n=9$) Control group ($n=9$) Sd Gender (G): 100% male (M) Years of service (S): 1 year	Yes	10 weekly 2 h sessions, and 12-month follow-up	Police trauma resilience training, based on imagery training and critical incident simulation - Included relaxation and imagery training with mental skill rehearsal, and critical incident simulated reenactment	Physical measures (PM): heart rate (HR), stress biomarkers (antithrombin and cortisol) Self-report: Profile of Mood States (POMS); visual analog scale (VAS) of perceived stress	- Training resulted in significantly less negative mood and heart rate reactivity, increase the antithrombin level, and better police performance compared to controls. Other benefits: improved stress resiliency
McCraty and Atkinson (2012)	USA	$N=65$ Intervention group ($n=29$) Waitlist control group ($n=36$) Sd: G, 84.6% M and 15.38% F A: $M=39$ ($\pm SD=$n.d.) S: $M=14.4$ ($\pm SD=$n.d.)	No	16-week, 3 sessions of 4 h, spaced 1 month	Coherence Advantage Program, focused on building resilience, and reduce operational long-term stress Based on: systematic approach (family-work), observation-learning model, leadership support, self-regulation skills, physiological and psychological coherence, stigmatization and scalability concepts, and role-play simulation of critical scenarios	PM: Heart rate variability (HRV) Self-report: Personal and Organizational Quality assessment (poQa) survey; Program Impact assessment; 5-point Likert scale for Scenario Stress Levels Performance Assessment; semi-structured interview for impact assessment	- Program improved capacity to recognize and self-regulate facing work and personal stressors. Reduction in stress, negative emotions, depression, and increased peacefulness and vitality compared to control group - Improvement of family relationships, effective communication, work team cooperation, and work performance

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Arnetz et al. (2013)	Sweden	$N=75$ Intervention group ($n=37$) Sd: G, 67.6% M and 32.4% F Control group ($n=38$) Sd: G, 68.4% M and 31.6% F	Yes	10 sessions, 1.5 h sessions, 18-month follow-up	Training program with psychoeducation (coping and stress), relaxation techniques, role-play and simulation of critical incidents, imagery training	PM: Prolactin, cortisol, and dehydroepian-drosterone-sulfate determined by radioimmunoassay technique Self-report: Bodily Symptom Scale; 3-item measure of coping (adopted from work-related psychosocial stressors); General Health Questionnaire; Karolinska Institute Sleep Questionnaire; Maastricht Questionnaire	Intervention group improved their general health and problem-based coping as compared to the control group, as well as, lower levels of stomach problems, sleep difficulties, and exhaustion
Weltman et al. (2014)	USA	$N=14$ Sd: G, 71.4% M 28.6% F A: 50% in 31- to 40-year range S: 20% between 2 and 5, 30% between 5 and 10, 50% between 10 and 20	No	2-h introductory session, 6-week individualized training, 4-week 1 h telephone mentoring	The Stress Resilience Training System (SRTS) Based on: i) information on physiology of stress and resilience, ii) training in a series of evidence-based energy self-regulation techniques, and iii) resilience-building skills using HRV coherence biofeedback to control progressively challenging games	PM: HRV Self-report: Personal and Organizational Quality Assessment (POQA; scales: emotional vitality scale, organizational stress, emotional stress and physical stress); SRTS app	- POQA results were highly positive. All four main scales showed improvement; emotional vitality improved by 25% and physical stress improved by 24%. Eight of the nine subscales showed improvement, namely, the stress subscale improving 40%. Participant responses were evenly positive and enthusiastic

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—*N*; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Andersen et al. (2015)	Finland	*N*=18 Sd: G, 100% male A: *M*=33.66 (±*SD*=4.81) S: *M*=9.75 (±*SD*=n.d.)	No	5-day 1 h session	Resilience promotion training program: - Included i) psych-oeducational and imagery components (Arnetz et al. 2009), and ii) intervention and psychophysiologi-cal intervention with breathing techniques and imagery (McCraty and Atkinson 2012)	PM: HR Self-report: Brief 5-Likert scale ques-tionnaire for partici-pants' perception on effectiveness on stress levels); Focus group – qualitative	- Participants were able to significantly reduce their average heart rate and improve their ability to engage in controlled respiration during simu-lated critical incidents. Improvements in stress responding facing more graphic critical incident scenarios
Andersen and Gustafsberg (2016)	Finland	*N*=12 Intervention group (*n*=6) Control Group (*n*=6) Sd: G, 100% M A: *M*=31.59 (±*SD*=n.d.) S: 5 years, SRT training: *M*=2.08 (±*SD*=0.76)	Yes	3 days training	"international Perfor-mance Resilience and Efficiency Program" (iPREP) - Based on: i) educa-tion on physiology of stress response system, energy management, and peak performance; ii) group instruction on mental focus and visualization; iii) biofeedback to practice controlled breathing exercises (enhance SNS control during stress)	PM: Cardiovascular measures (HR, heart rate recovery time, and blood pressure) Self-report: 10-point Likert scale designed by the team for: i) Pre-test: anticipation stress, self-confidence in decision-making, situational awareness, and correct actions; ii) Post-test: scenario stress level, decision-making, situational awareness, self-confidence in correct use of force, overall performance, ability and time to de-stress	- Intervention group displayed significantly better physiological control, situational awareness, and overall performance, and improved decision-making in use of force decisions than officers in the control group

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—*N*; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Andersen et al. (2016)	Finland	$N=18$ Sd: G, 100% M A: $M=33.53$ $(\pm SD=4.3)$ S: $M=9.75$ $(\pm SD=4.51)$ and SWAT-S: $M=6.67$ years	No	5-day regular tactical training	Resilience Training Program, based on: i) police stress management, health, and optimal performance; ii) psychophysiological intervention (controlled breathing, positive imagery and emotions, positive elements of police culture); iii) visualization while listening to critical incident scenarios	PM: cortisol Self-report: First Responder Survey on Stress, Trauma, and Restoration questionnaire (Pre- 2-weeks only)	- Participants were significantly more likely to exhibit basal cortisol levels higher than the civilian across all of the 5 days of intensive training. However anticipatory cortisol, was significantly lower in Day 5 than in Day 1 of the training period
Ramey et al. (2016)	USA	$N=38$ Pilot A immediate $(n=20)$ Sd: G, 70% M vs. 30% F A: $M=39.4$ $(\pm SD=9.1)$ S: $M=13.6$ $(\pm SD=7.7)$ Pilot B 3-month lag $(n=18)$ Sd: G, 83% M and 17% F A: $M=43$ $(\pm SD=5.0)$ S: $M=15,9$ $(\pm SD=6.1)$	No	2 educational classes 2 h long, 2–3 weeks apart, plus 3 months in-the-field practice Baseline, 3 and 6 months	Experimental Pilot Resilience Study, based on methodology successfully employed in the military and elsewhere: - Consisted of educational class and telementor session	PM: HRV; blood pressure; and blood glucose Self-report: Perceived Stress Scale (PSS); Maastricht Questionnaire 9-item version of Form B; Impact Events Scale; Personal and Organizational Quality Assessment-R; Response to Stressful Experiences Scale	- Age was significantly associated with changes on several measures of psychological stress. Associations were found between coherence and improved HbA1c and stress due to organizational pressures. Improvements in sympathetic and parasympathetic contributors of HRV were significant - Positive qualitative feedback

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Page et al. (2016)	USA	N = 63 Intervention group (n = 33) Control Group (n = 30) Sd: G, 91% M and 9% F A: comprised between 22 and 36	Yes	2 sessions of 75-min psychoeducation; followed by OC Spray event training	Oleoresin Capsicum (OC) spray training, based on techniques as realistic scenarios simulation, breathing, mental performance imagery, attentional focus and psychoeducation on cardiovascular physiology and stress-reducing techniques	PM: Cardiovascular (HR and hemiglobin-oxigen saturation levels) Self-report: Performance assessment on 5-point Likert scale made by team, on participants' perception on performance, stress, confidence, pain and use of techniques	- Experimental group demonstrated significantly better memory recall of salient aspects of the OC spray event. Cadets from both groups using controlled breathing scored significantly higher in memory recall - Heart rate increased from baseline to pre and post-OC measures across groups, but there were no group differences at these time points
Ramey et al. (2017)	USA	N = 34 Intervention group (n = 17) Sd: G, 82.4% M and 17.6% F A: $M = 24.4$ ($\pm SD = 5.5$) Control group (n = 17) Sd: G, 82.4% M and 17.6% F A: $M = 27.0$ ($\pm SD = 6.1$)	No	2-h education class for all Intervention: 4 tel-ementor 1-h sessions, spaced 2–3 weeks, 2-month follow-up	Educational class based on i) the physiology of stress, triggers of stress, and sensory awareness; ii) instruction and practice for autonomic response to stress (breathing control and HR biofeedback); and iii) instruction on how to improve decision-making by focusing on positive emotions	PM: HRV Self-report: PSS; Maastricht Questionnaire; Impact Events Scale; Personal and Organizational Quality Assessment-R (POQA-R); Response to Stressful Experiences Scale (RSES) App: HeartMath Inner Balance app	- No statistically significant differences between the groups were found for self-reported measures of stress and resilience. For the treatment group, change in coherence was significant and improvement in the POQA-R subscale of emotional buoyancy, which correlated significantly with number of practice sessions, and marginally with change in coherence

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—*N*; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Tegeler et al. (2020)	USA	*N*=14 Sd: G, 100% M A: *M*=45.7 (±*SD*=5.6) S: *M*=23.2 (±*SD*=4.3)	No	2 sessions in a half-day, followed by 1.5/2 h series of sessions	High-resolution, relational, resonance-based, electroencephalic mirroring (HIR-REM), based on: - Non-invasive, closed-loop brain echoing neurotechnology, for "real-time self-optimization of brain activity" - Number of sessions (S) varied across participants according to brain pattern evolution; Mean S: 12,2 (±Sd=2.7)	PM: brain electrical activity (electroencephalogram), HRV and blood pressure Self-report: Insomnia Severity Index (ISI); Center for Epidemiologic Studies Depression scale (CES-D); Posttraumatic Stress Disorder Checklist—Civilian version (PCL-C); Generalized Anxiety Disorder 7-item scale (GAD-7); PSS; EQ-5D	- All symptom inventories improved significantly, with durability for 2 months after completion of the intervention. The use of HIRREM was also associated with significant increases in HRV and brain measures
Di Nota et al. (2021)	Canada, Ontario	*N*=187 Intervention group (*n*=82) Sd: G, 85.4% M and 14.6% F A: *M*=33.3 (±*SD*=6.16) S: *M*=7.48 (±*SD*=5.32) Waitlist control group (*n*=105) Sd: G, 82% M and 18% F A: *M*=34.3 (±*SD*=6.55) S: *M*=8.2 (±*SD*=5.42)	No	1 full-day intervention, 1-year follow-up	Autonomic Modulation Intervention 1-day intervention on decision-making, based on: - Psychoeducation on stress physiology; in real-time biofeedback training (HRVBF); and reality-based training scenarios (de-escalation and decision-making skills; sensory awareness; visualization and mental rehearsal)	PM: HRV	- No significant training-related improvements to behavioral or physiological outcomes were found immediately post-intervention or at follow-up

Table 3 (continued)

Author and year	Country and police Setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Michela et al. (2022)	Netherlands	N=9, Sd: G, 100% M, A: M=43.2 (±SD=6.45), S: M=18.4 (±SD=8.6)	No	10-session program	Experimental Virtual-Reality (VR) breathing-based biofeedback training, based on emotional regulation model for breathing-based VR - VR selective shoot/don't shoot game	PM: Breathing and HR Self-report: Before—Trait-Assessments of Anxiety; Prior Gaming Experience; During—self-constructed questionnaire for plan-making in real-life policing situation; self-assessed performance ratings; After—Intrinsic Motivation Inventory Instruments: before/after each VR session	- Eight out of nine participants showed improved breathing control in action, with a positive effect on HRV, while also improving their in-game behavioral performance. The breathing-based skill learning transferred to sessions without biofeedback. All participants remained highly engaged throughout the training

measures were used. In terms of self-report measures, the majority assessed performance using instruments developed by the researchers specifically for the program, either using participant's self-assessed performance or instructors' observation-based assessment. Other self-report measures incorporated affective states and mental health inventories, organizational stress, and workplace quality, and other general and physical health. On the other hand, among physiological measures used, most were cardiovascular measures, such as heart rate and heart rate variability, as well as different physical outcomes single or combined with the previous, such as cortisol, biomarkers, breathing, and brain activity.

Finally, with regard to the main findings and efficacy of the interventions, the majority showed significant findings in the target variables, two found moderately significant findings, and three obtained low overall efficacy of the training intervention.

CBT and Other Resilience Training Programs

As Table 4 shows, this final group of programs comprises six studies, that have been published since 2017. This was the most diverse group in terms of country setting, including the USA, the Netherlands, Canada, Greece, China, and India, with one study from each country (16.67% each). Approximately one-third followed an RCT study design (16.7%), while the rest followed a nonrandomized, mostly pre- post-test study design (83.3%). The sample size ranged from 32 to 305 participants, with an average of 150 ($SD = 124.9$). The format ranged from a 3-day training program to three-sessions per week over 2 months, and one study did not specify the duration or number of sessions. Concerning the theoretical approach, all studies within this group delivered adapted structured training based on the CBT approach, using techniques such as psychoeducation, stress management and coping skills, cognitive reappraisal, imagery techniques, breathing and relaxation techniques, critical scenario simulation, and debriefing. In addition to the CBT model, two studies also mentioned positive psychology, the person-centered approach, and sports performance as their theoretical foundations.

Regarding the instruments and target outcome measures used, most of the studies focused on resilience, depression, anxiety, and other mental health-related instruments, job satisfaction and organizational commitment, PTSD symptoms, alcohol use, sleep, stress, coping, and socioemotional skills. Concerning their main findings, the majority found highly to moderately significant results of the intervention, and only two found weakly significant results considering the variables of interest.

Table 4 CBT and other RTP characteristics, content, and main findings

Author and year	Country and police setting	Participants (sample size—*N*; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Arble et al. (2017)	USA	*N* = 32 Sd: Gender (G) 78% males (M) and 22% females (F) Age (A): *M* = 29.1 (± *SD* = 6.85); all junior police officers in 1st year of active policing	No	1 week, 5 sessions of 1.5 h, 1-year follow-up 2 cohorts (*n* = 16)	Imagery-based primary prevention program, based on Swedish version (Arnetz et al. 2013) - Mindfulness and emotional awareness components, optimal police tactics during imagined scenarios, and evidence-based set of techniques for how to cope adaptively after trauma exposure	Self-report: Brief COPE; Sources of Support Scale; PTSD Checklist; Hospital Anxiety and Depression Scale (HADS); Karolinska Institute Sleep Questionnaire; Alcohol Use Disorders Identification Test; 5-item Likert scale for participant feedback: Semi-structured interviews	- Compared to pre-training, officers showed significant increases in the use of positive reframing and humor and significant reductions in anxiety and alcohol use over the year. Trauma symptoms did not increase. Positive qualitative feedback
van der Meulen, et al. (2018)	Netherlands	*N* = 305 Intervention group (*n* = 138) Sd: G, 73.9% M and 27.6% F A: *M* = 43.93 (± *SD*, 11.15) S: *M* = 19.09 (± *SD*, 11.93) Comparison group (*n* = 167) Sd: G, 72% M and 28% F A: *M* = 45.96 (± *SD*, 11.40) S: *M* = 23.71 (± *SD*, 12.44)	No	3 days, 8-h training, 3-month and 9-month follow-up	Mental Strength Training (MHT), based on sports performance to enhance psychological resilience - Lectures and practical exercises, namely, vitality management and Heartmath stress techniques	Self-report: Mental Toughness Questionnaire-48 (MTQ-48); Resilience Scale-nl (RS-nl); Symptoms Check-List 90-R (SCL-90-R); 22-item Self-Rating Inventory for PTSD (SRIP) App: Heartmath® app	- Mixed-effects models showed training effects on Interpersonal Confidence; - All effects yielded small effect (limited practical relevance). Officer's appraisal of training benefits on resilience enhancement was largely negative, and no indications of significant improved of officer's psychological resilience or mental health

Table 4 (continued)

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Carleton et al. (2018)	Canada	N = 147 Sd: G, 43.5% M and 56.5% F A: M = 41.52 (± SD = 8.51)	No	6-month and 12-month follow-up *No information on length and sessions number	Road to Mental Readiness (R2MR) developed by Canadian Department of National Defense" - Supported by 1) evidence-based psychoeducation on mental health and stress; 2) evidence-based Cognitive-Behavioral Therapy (CBT) for stress management skills	Self-report: Alcohol use disorders identification test; BRS; DASS-21; Mental health knowledge schedule (MAKS); Open minds survey of workplace attitudes (OMSWA); Posttraumatic stress disorder checklist for DSM-5 (PCL-5); Utrecht work engagement scale-9 items (UWES-9); 2 Study-specific Questionnaires	- No significant impact on mental health symptoms, resilience and work engagement - Small but significant reduction in stigma at post-training, and overall participants described training as helpful
Romosiou et al. (2019)	Greece	N = 50 Intervention group (n = 23) Sd: G, 77% M and 23% F A: M = 36.78 (± SD, 4.73) S: M = 17.87 (± SD, 2.94) Control group (n = 27) Sd: G, 70% M and 30% F A: M = 36.44 (± SD 4.56) S: M = 17.0 (± SD 3.58)	No	5 weekly, 4-h session (10-day interval between sessions), 3-month and 2-year follow-up	Integrative group program, based on CBT, person-centered approach, and positive psychology approach - Addressed emotional intelligence, empathy, resilience and stress management	Demographic questionnaire; Schutte Emotional Intelligence Scale. (SEIS); Interpersonal Reactivity Index (IRI); Perceived Stress Scale (PSS); Connor-Davidson Resilience Scale (CD-RISC)	Significant improvement of emotional intelligence, empathy, resilience and stress management comparing to control, including in follow-up
Au et al. (2019)	China	N = 300 Phase 1 (P1, n = 90) Phase 2 (P2, n = 83) Phase 3 (P3, n = 127) *No SD provided	No	P1: 6 weekly 2.5-h sessions P2: 6 weekly half-day, and full-day P3:4 half-day; 10-week and 1-year follow-up	Emotional Fitness-Training - Workshop included lectures, reenactments and animations in videos, group discussions on real-life scenarios, self-reflection and take-home practices that included healthy daily habits and behavioral and cognitive practices	The Brief Resilient Coping Scale (BRCS); The Positive State of Mind (PSOM); The Cognitive Flexibility Scale (CFS); The 12-item General Health Questionnaire (GHQ); 8-item scale adapted from Organizational pride; 12-item scale adapted from Organizational Commitment Questionnaire (OCQ)	- Significant improvements on the seven measures compared to pretest in all 3 phases; varying effectiveness in the 3 phases. Among workshop participants, those with better emotional fitness also reported greater pride and commitment. Workshop participants reported greater pride and commitment compared with nonparticipants of the same rank

Table 4 (continued)

Author and year	Country and police setting	Participants (sample size—N; and sociodemographic data—Sd)	RCT	Intervention format	Theoretical approach and content	Outcome measures	Main findings
Chitra and Karunanidhi (2021)	India	$N = 63$ Intervention group ($n = 33$) Sd: G, 100% F A: $M = 26.88$ ($\pm SD$, 2.09) S: 4.97 ($\pm SD$, 1.36) Control group ($n = 30$) SD: G, 100% F A: $M = 28$ ($\pm SD$, 2.78) S: 5.47 ($\pm SD$, 1.89)	Yes	3 times a week session, 1.5-h sessions for 2 months, 2-month follow-up	Experiential approach based on psychoeducation, reflection, role-playing, modeling, self-monitoring of responses, and image-guided relaxation	Self-report: Occupational Stress Inventory (OSI); CD-RISC; Overall Job Satisfaction Scale; Psychological General Well-being Index (PGWBI)	- Resilience training was effective in enhancing resilience, job satisfaction, and psychological well-being of female police officers and in reducing occupational stress - Medium effect sizes were reported, and positive qualitative feedback provided

Discussion

Based on the results of this review, mental health and resilience within the police population have been the focus of much research. However, this interest is relatively recent compared to other populations and high-risk occupations, especially in relation to mental health prevention and promotion-focused interventions. As a result, there are still some unanswered questions regarding what resilience training can offer or how effective it can be with the police, including information about longer-term effects through longitudinal studies, although stress-resilience focused interventions started to develop before 2000. In this line of research, focused on the police, Arnetz and colleagues' (2009) study is seminal since it focused on both physical and physiological stress, reflecting the physical-mental health axis. Their work has led to various resilience training programs with particular characteristics.

Although experimental, the first studies developed within this framework have shown significant improvement in both physical as well as mental health outcomes, decreased stress activation and somatization symptoms (Arnetz et al. 2013; Weltman et al. 2014), and improvements in other indirect variables such as coping skills, interpersonal relationships, and work performance (McCraty and Atkinson 2012). Furthermore, these types of programs have been evolving into training designed to empower police officers to optimize their performance when dealing with emotionally challenging situations. These have been showing promising and notable outcomes regarding situational awareness and decision-making (Andersen and Gustafsberg 2016), performance outcomes (Page et al. 2016), and physiological awareness (Michela et al. 2022), which are central to regulatory processes.

Within this group of interventions, training intervention delivery varied widely in terms of intervention format and content. While some clearly identified their theoretical foundations (e.g., Andersen and Gustafsberg 2016; Michela et al. 2022), others combined evidence-based techniques (e.g., Page et al. 2016; Di Nota et al. 2021) or were adapted from previous studies (Andersen et al. 2015). A possible limitation of NB-BRT studies is that there are a few training programs that rely on instruments developed by the researchers to assess the outcome variables of interest, which can pose a risk of bias when evaluating intervention effectiveness (Andersen et al. 2015; Andersen and Gustafsberg 2016; Page et al. 2016). Some did not use any self-report assessment in addition to physiological measures (Di Nota et al. 2021), which underestimates the subjective evaluation of improvement and contribution of the intervention to their well-being. Nonetheless, most found significant results, namely, better memory recall of critical incidents (Page et al. 2016), improved situational awareness, decision-making in the use

of force decisions, and overall performance (e.g., Andersen et al. 2015; Andersen and Gustafsberg 2016; Michela et al. 2022). In contrast, despite Di Nota and colleagues (2021) finding no significant results from their program, one-third of their participants were not able to return to the basal state after exposure, indicating the urgent need for more stress modulation skills training. This suggests that biofeedback may prove to be a golden technique to include in future officers' training to improve resilience and well-being.

Although NB-BRT is the oldest among resilience training with police officers, mindfulness-based programs have shown high consistency and are theoretical and empirically based, and thus the scientific community has observed a fast-growing number of these studies. One of the reasons relies on the fact that MBRT interventions adapt their curriculum to police specific challenges and needs (e.g., Christopher et al. 2016; Kaplan et al. 2017; Trombka et al. 2021). The focus of these interventions is to enhance officers' physiological and psychological resilience, based on techniques such as psychoeducation, practical exercises on stress and stress management, personal and situational awareness, cognitive diffusion, and mindfulness exercises, such as body scan, mindful movement, mental focus, and meditation (e.g., Bergman et al. 2016; Christopher et al. 2018). Among the MBRT programs, a group of researchers added inhibitory control behavioral tasks to socioemotional stimuli to support the development of decision-making and self-regulation skills in emotionally challenging police scenarios (Grupe et al. 2021a, b). Interestingly, one study compared three mindfulness-based approaches, and, although there were no significant differences between groups, they all showed significant improvement in stress, anxiety, and depression (Khatib et al. 2022). Generally, this group showed promising results regarding a decrease in key indicators of psychological strain and improvement in the general well-being of police officers.

Finally, CBT and other RTPs diverge from other approaches, as they use broader and more integrative approaches to building resilience. As part of the training, this subgroup of programs incorporates mindfulness, breathing, and relaxation techniques (Arble et al. 2017; Chitra and Karunanidhi 2021); psychoeducation and well-established CBT model strategies (Carleton et al. 2018; Romosiou et al. 2019); and imagery training and stress management techniques similar to NB-BRT programs (Arble et al. 2017; van der Meulen, et al. 2018), while they draw from several theoretical models such as CBT, positive psychology, person-centered approach, emotional-based models, and sports performance. Only two published programs used RTC study designs (Chitra and Karunanidhi 2021; Romosiou et al. 2019). The CBT and other RTP groups of programs had the most considerable sample sizes and assessed resilience directly and more consistently (Au et al. 2019; Chitra and

Karunanidhi 2021; Romosiou et al. 2019; van der Meulen, et al. 2018).

Despite the officers' resilience being the primary goal of these programs, most do not use resilience-validated self-report measures. Considering the three main recommended resilience instruments (Joyce et al. 2018), only four out of the 31 studies used the Brief Resilience Scale by Smith (2008; Carleton et al. 2018; Christopher et al. 2016; Hoeve et al. 2021; Kaplan et al. 2017), while three used the Connor-Davidson Resilience Scale (Chitra and Karunanidhi 2021; Christopher et al. 2018; Romosiou et al. 2019), and two studies from the third group used two other resilience scales: the Brief Resilient Coping Scale by Sinclair and Wallston (2004; Au et al. 2019) and the Resilience Scale-NL by Portzky (2008; van der Meulen, et al. 2018). It should be noted that none of the NB-BRT interventions used a resilience measure. Additionally, the three groups of programs diverged in their typical target outcomes. The MBRT group tended to focus on mindfulness, general health, and quality of life outcomes; the BBRT on stress, trauma, and organizational-related outcomes; and the subgroup of CBT and other RTP on depression, anxiety and other affective problems, alcohol consumption, coping, and resilience itself, perhaps due to the nature of the intervention itself. Finally, it is suggested that these interventions could benefit from including measures of mechanisms of change, in addition to the direct effects of the intervention on the target outcomes (Hoeve et al. 2021). Kaplan and colleagues (2017) raise further awareness of overlapping instruments regarding the outcomes evaluated. This might be related to the lack of consensus regarding what should be measured when resilience is addressed.

Overall, we can conclude that RTPs offer a promising prevention-focused intervention, particularly for a high-stress occupation such as policing. Finally, besides intervention effectiveness rates, one of the most relevant feedback of the intervention was the qualitative assessment of the usefulness of the training (e.g., Carleton et al. 2018; Márquez et al. 2020; Michela et al. 2022; Ramey et al. 2016), revealing to be one of the authors' strongest recommendations to be included in future interventions. Moreover, including realistic critical scenarios as part of training improved police objective performance, well-being, overall mental health-related indices, and improved physiological stress response when physiological measures were used (Arnetz et al. 2009). To this end, all the groups of resilience training programs identified here included such techniques, particularly NB-BRT, for which groundbreaking technology has been incorporated to improve police performance in a real-life secure environment through virtual reality settings (Di Nota et al. 2021; Michela et al. 2022; Page et al. 2016; Weltman et al. 2014). In fact, other training programs regarding stress resilience focused on other high-risk occupations, such as

firefighters, emergency services, and the military, have shown optimistic results regarding resilience intervention, especially concerning resilience, stress, coping, well-being, mental health-related variables, and self-efficacy (Brassington and Lomas 2020; Leppin et al. 2014; Wild et al. 2020).

Some authors suggest using novel technology that could maximize the effect of exposure to realistic scenarios, and practice skills central to police performance (e.g., critical decision-making, stress awareness, coping), including virtual reality and "game-like" paradigms that elicit similar levels of stress while in a safe but realistic dynamic simulator (Michela et al. 2022; Page et al. 2016; Weltman et al. 2014). Finally, officers would benefit from including resilience training in their organizational practices for more lasting, systemic, and sustainable results in police practice.

Strengths, Limitations, and Future Directions of Resilience Programs with the Police.

Some of the main criticisms emphasized by the literature of resilience training are the lack of congruence in relation to the resilience concept itself and the heterogeneity of RTPs in structure, format, and target outcomes, which is also perceptible in the present review. In the future, having good baselines of measured resilience and related variables that can serve as predictors of intervention efficacy and incorporating evidence on the most effective resilience training components can help develop stronger preventive-based RTPs.

Specifically, addressing the police population, the majority of the studies point to two main limitations. The first one refers to the representation of the sample, either concerning using only one police department/organization and small sample sizes, as pointed by the authors, which can limit the statistical power of intervention efficacy and generalization of results (e.g., Arble et al. 2017; Arnetz et al. 2009; Di Nota et al. 2021; Hoeve et al. 2021; Kaplan et al. 2020; Márquez et al. 2020; Michela et al. 2022; Navarrete et al. 2022; Ramey et al. 2017; Tegeler et al. 2020). Although the sample is often considered small and unrepresentative, this population is known to be of difficult access. Therefore, a future discussion topic should address what can be a representative sample size for the police population considering the difficulties of access for data collection. Second, most studies do not follow an RCT study design, which can restrict study findings to the larger police population (e.g., Andersen et al. 2016; Di Nota et al. 2021; Grupe et al. 2021a; Hoeve et al. 2021; Márquez et al. 2020; Navarrete et al. 2022). However, most studies followed an experimental design, and while RCT studies might not always offer the best research design, particularly considering populations with particular characteristics (Cook and Thigpen 2019; Deaton and Cartwright 2018). Particular external variables also restricted the intervention development in some cases. Examples of these were the lack of funding and financial constraints (Christopher et al. 2016), and organizational

issues typical to police organizations, such as operational demands, sudden changes to schedule, and lack of interest (Di Nota et al. 2021). Moreover, the present pandemic of COVID-19 and adjustments to interpersonal interactions and work must be considered this might have affected the final outcomes of recent studies.

There are strong clusters of general recommendations concerning the police population. We recommend that researchers and clinicians involved in preparing these programs include reality-based critical scenario simulation, where possible. This can help to improve decision-making, coping, and self-regulation, and performance in challenging situations while also providing ecological validity and the transfer of learned skills to real contexts (Andersen and Gustafsberg 2016; Arnetz et al. 2013; Di Nota et al. 2021; Hunsinger et al. 2019). Another proposal for future work is related to the use of physiological measures and in addition to self-report measures, as officers tend to underreport mental health issues and bias the results (Christopher et al. 2018; Hoeve et al. 2021; Kaplan et al. 2017). Additionally, the inclusion of biofeedback in programs has been central in promoting stress awareness and, consequently, adopting more adaptive coping behaviors, better decision-making and overall performance, reflecting on self-esteem, job satisfaction, and well-being (e.g., Andersen and Gustafsberg 2016; McCraty and Atkinson 2012; Michela et al. 2022; Tegeler et al. 2020). Plus, some authors suggest the need for continued training to maintain its benefits (Christopher et al. 2018), but stress the need for shorter training interventions due to police limited time and resources (Andersen and Gustafsberg 2016; Romosiou et al. 2019).

Weltman and colleagues (2014) additionally highlight the need to include the role of mentor and organizational support as part of resilience training, owing to the impact it has on police well-being and, consequently, work performance. Duchek (2019) applies the concept of organizational resilience which might be interesting to consider to the police organization as a subject of intervention itself, considering the police culture and well-known impact of organizational stressors in police's mental health (Craddock and Telesco 2022; Werner-de-Sondberg et al. 2021). Finally, other authors suggest further broadening the evaluation of the intervention's impact on the community, particularly marginalized and non-white ethnic groups and individuals (Grupe et al. 2021b). Notwithstanding some inconsistencies regarding intervention outcomes, all studies stress the need and benefits of prevention-focused interventions and resilience training.

Additionally, continued training is advocated for sustaining the benefits of interventions while recognizing the necessity for shorter training sessions to accommodate the demanding schedules of police officers. The importance of mentorship and organizational support within resilience

training programs cannot be overstated, given their profound influence on officer well-being and performance. Considering the distinctive culture of law enforcement, the concept of organizational resilience and its potential application to police organizations warrants exploration. Acknowledging the significant impact of organizational stressors on mental health, this approach holds promise in bolstering the resilience of law enforcement agencies.

Finally, as part of a comprehensive approach, evaluating the impact of interventions on marginalized and ethnic minority groups, as well as the broader community, is an essential step toward promoting inclusivity and equity within resilience programs.

Despite some inconsistencies in outcomes, prevention-focused interventions and resilience training are paramount in enhancing the well-being and performance of law enforcement personnel. This collective body of research underscores the pressing need for a proactive and resilient-oriented approach to supporting those who serve and protect our communities.

Data Availability The database generated with all the results reported in this study are not published or publicly available. However, following good research practices, the database is available upon request from authors through the contacts provided (n0978414@my.ntu.ac.uk).

Declarations

Conflict of Interest The authors declare no competing interests.

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