

Bibliometric Analysis of Publications in Police Training with R Program

R Programı ile Polis Eğitimi Alanındaki Yayınların Bibliyometrik Analizi

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Öz

Bu çalışma, Web of Science (WoS) indeksinde yer alan polis eğitimi literatürünün kapsamlı bir bibliyometrik analizini sunmakta ve R'deki Bibliometrix paketini kullanarak 710 yayını incelemektedir. Karamanoğlu Mehmetbey Üniversitesi'nin kurumsal aboneliği aracılığıyla erişilen analiz, alanın gelişimini haritalandırarak yayın hacmindeki ve tematik çeşitlilikteki önemli artışı vurgulamaktadır. Karar verme gibi geleneksel odak noktalarına artık nöroçeşitlilik, stres yönetimi ve teknoloji kullanımı gibi yeni temalar eklenmiştir. Policing: An International Journal ve Police Practice and Research gibi önemli dergiler akademik tartışmaları domine etmektedir. Lotka ve Bradford yasaları, yazarların üretkenliği ve dergilerin önemi arasındaki dengesizliği ortaya koyarak akademik mentorluk ve disiplinler arası işbirliğinin gerekliliğini vurgulamaktadır. Tematik kümeler psikolojik hazırlık, operasyonel beceriler ve uzmanlık eğitimi üzerinde dururken, otizm ve anksiyete gibi alanlarda eksiklikler devam etmektedir. Ortak atıf ve işbirliği analizleri, uluslararası katılımın arttığını göstermektedir, ancak Batı merkezli bir önyargı devam etmektedir. Bulgular, polis eğitiminde kapsayıcı, kanıta dayalı reformlar ve araştırmaya daha geniş küresel katılım çağrısında bulunmaktadır.

Anahtar Kelimeler: Polis, Polis Eğitimi, Bibliyometrik Analiz, R Program

Abstract

This study presents a comprehensive bibliometric analysis of police training literature indexed in the Web of Science (WoS), examining 710 publications using the Bibliometrix package in R. Accessed via Karamanoğlu Mehmetbey University's institutional subscription, the analysis maps the field's evolution, highlighting significant growth in publication volume and thematic diversity. Traditional focuses such as decision-making are now joined by emerging themes like neurodiversity, stress management, and technology use. Key journals including Policing: An International Journal and Police Practice and Research dominate scholarly discourse. Lotka's and Bradford's Laws reveal imbalances in author productivity and journal prominence, underscoring the need for academic mentoring and interdisciplinary collaboration. Thematic clusters emphasize psychological preparedness, operational skills, and specialized training, while gaps persist in areas such as autism and anxiety. Co-citation and collaboration analyses show increasing international engagement, yet a Western-centric bias remains. The findings call for inclusive, evidence-based reforms in police education and broader global participation in research.

Keywords: Police, Police Education, Bibliometric Analysis, R Program

1. Introduction

Education has been the concern of all civilised societies in the world. The achievement of behavioural change, the creation of an attitude and reflex as a result of education are among the fundamental objectives of education. In this regard, the education of police officers assumes a multifaceted and pivotal role in the contemporary context of security services, necessitating a blend of experiential knowledge and professional proficiency. The police, as the instrument of coercion of the modern state (Poggi, 1990), undertake various practices within the framework of the law and authorised powers while responding to “social disorder” (Neocleous, 2000). It is evident that policing constitutes the most pivotal element in the maintenance and protection of public order within states. This role is characterised by the effective utilisation of communication channels, a factor that is further compounded by the profession’s high level of visibility within society. It is evident that the cultivation of police officers who demonstrate proficiency in this profession, characterised by their knowledge, experience and talent, is instrumental in enhancing the effectiveness of the police force. This, in turn, has a direct and significant impact on the success of states in fulfilling their obligations towards society.

The contemporary world is experiencing rapid social change and transformation as a result of the impact of globalisation. In order to maintain pace with such rapid change, states are required to implement new structures and updates in the field of public services. The police profession has emerged as a manifestation of people's desire to live in safety and it has a deep-rooted history. Consequently, it is imperative to ascertain the requisite competencies for the training of police officers in this capacity and to formulate a scientific education plan that will address these needs.

Despite the fact that the police profession demands a high level of physical activity, there are some challenges that police officers face in the modern world. Contemporary policing imposes a distinct set of requirements on police officers that differ significantly from those that previous generations of officers had to cope with. The allocation of new tasks to police officers has led to an increased emphasis on effective communication and cooperation in order to successfully complete these tasks (Bonneau & Brown, 1995). Consequently, police officers spend the majority of their working day performing low-intensity activities and the profession is thus defined as essentially sedentary (Anderson et al., 2001).

Nevertheless, the profession can still be physically demanding due to the regular occurrence of periods of high physical exertion. Such events typically manifest acutely and can be characterised as high-pressure, pivotal and potentially life-threatening for both the police officer and the civilians in proximity (Bonneau & Brown, 1995; Boyce et al., 2009). It is evident that while a substantial proportion of the duties can be executed with minimal reliance on the physical fitness of the police officer, a certain degree of physical aptitude is imperative for the execution of specific tasks.

Police departments are organisations primarily responsible for the safety and security of society (Sørensen et al., 2000; Kukić & Dopsaj, 2016; Kukić et al., 2017). A number of tasks are performed by police officers that require great physical exertion. These include running to apprehend a suspect, dealing with uncooperative assailants, fighting and carrying injured or unconscious individuals (Sharkey & Davis, 2008; Pryor et al., 2012). These activities are often undertaken while wearing and carrying external loads (Carbone et al., 2014; Baran et al., 2018).

In light of the nature of these tasks and the job requirements, it is evident that police officers must be physically prepared to perform these tasks adequately and effectively and with reduced risk of injury (Anderson et al., 2001; Dopsaj et al., 2007; Guffey et al., 2015). In this context, it is vital to acknowledge the significance of good physical fitness as a prerequisite for the health and physical performance of police officers (Dawes et al., 2017; Kukić & Dopsaj, 2017).

The effective management of law enforcement has historically demanded a distinct amalgamation of physical, cognitive, emotional and interpersonal competencies. Contemporary police officers are equipped with an array of gadgets, such as body-worn cameras and utilise sophisticated equipment in their patrol vehicles, including

computers. Additionally, they are subject to heightened public scrutiny compared to previous generations, largely due to the ubiquity of smartphones and social media. It is an irrefutable fact that contemporary policing is an extremely complex and challenging endeavour.

Consequently, law enforcement agencies are confronted with the challenge of recruiting, training and retaining police officers who are both psychologically and physically fit (Blumberg et al., 2019). Police officers are expected to be in good health, possess specific physical characteristics and demonstrate a high level of physical fitness. In order to maintain optimal levels of physical and mental health and thereby ensure the long-term effectiveness of their professional performance, it is imperative that police officers place significant emphasis on regular physical activity and exercise (Strating et al., 2010; Muirhead et al., 2019). In accordance with the stipulated requirements of the police profession, it is imperative that individuals possess optimal physical, physiological and mental health.

1.1.Purpose of the Research

The present study undertakes an analysis of Web of Science (WoS) in the context of police education. The objective of the present study is threefold: firstly, to map the current research landscape; secondly, to identify emerging trends and thematic foci; and thirdly, to provide a foundation for future research. By uncovering patterns in publication activity, collaborative networks and influential studies, this research offers both theoretical insights and practical guidance for advancing academic discourse and shaping evidence-based educational policies.

The present study contributes to the field by outlining developmental trajectories for future research, supporting the dissemination and application of existing findings and promoting academic engagement with police training. The analysis is structured around the following thematic dimensions:

- What are the general descriptive structures employed?
- What are their conceptual structures?
- What are their social structures?
- What are their intellectual structures?

1.2. Literature Review

In bibliometric studies, social network analysis serves as a valuable tool for uncovering the intellectual and social structure of a given field (Johnson & Samakovlis, 2019; Mehraliyev et al., 2019). The present analysis of co-word clusters in police education literature reveals diverse thematic orientations, yet the relatively small number of nodes suggests that certain institutions and scholars in the domain remain underrepresented or insufficiently connected in terms of influence and collaboration.

The role of police training has garnered increasing scholarly attention, particularly in response to global crises such as the COVID-19 pandemic. Frenkel et al. (2021) highlighted the psychological toll of the pandemic on police officers, identifying risk of infection and poor communication as the most pressing stressors. While officers demonstrated adaptive responses over time, strain levels varied significantly across individuals. Their findings suggest a need for differentiated support strategies at governmental, organizational, and individual levels.

Similarly, Shodunke (2022) explored the enforcement of Nigeria's lockdown measures, drawing attention to how economic hardship and longstanding distrust in authorities undermined citizen compliance. The study further exposed how police misconduct-especially bribery and extortion-fueled civil unrest and non-compliance, intensifying confrontational interactions between police and citizens. These findings reinforce the necessity for institutional reform and improved accountability mechanisms within law enforcement agencies.

Beyond crisis response, the long-term effectiveness of police training methodologies has come under scrutiny. Soderstrom et al. (2025) assessed mental health first aid training for officers working with youth, noting significant short-term improvements in participants' confidence and preparedness. However, many of these

benefits diminished by the 90-day mark, pointing to the importance of ongoing professional development and follow-up interventions to sustain training outcomes.

Emerging technologies, particularly Metaverse-based training platforms, are reshaping how police forces prepare for complex threats. Oh (2022) proposed a comprehensive digital training model incorporating real-time, scenario-based simulations. The immersive and interactive nature of such platforms offers promise for enhancing decision-making, stress resilience, and collaborative responses. Nevertheless, the effectiveness of such innovations is contingent on reliable infrastructure, ethical safeguards, and adequate user training.

Kleygrewe et al. (2022) examined law enforcement training frameworks in six European countries, revealing that training quality is often constrained by rigid institutional structures and limited resources. While trainers were generally motivated and committed, they reported that existing systems hindered their ability to deliver comprehensive instruction. In the Ethiopian context, Mitiku (2023) documented a steady decline in training quality, attributing it to insufficient oversight and a lack of responsive management practices.

The foundational role of police education in upholding societal safety was affirmed by Rogério Lino (2004), who emphasized the delicate balance between democratic freedoms and law enforcement obligations. His call for integrating universities into police training underscores the value of a multicultural, cooperative model for developing curricula aligned with global standards. Such partnerships could significantly enhance training content in critical areas such as human rights and cybercrime.

Pepper et al. (2025) extended this analysis through a comparative study of police training systems in the USA, UK, Canada, and Australia. Despite notable differences in implementation, the study revealed consensus on the need for a standardized, integrated training model that combines practical fieldwork with academic instruction. Moreover, it drew attention to how political dynamics, funding disparities, and recruitment policies influence the effectiveness of training programs.

Recent thematic trends also indicate a growing concern for diversity and inclusion within police institutions. Panter (2017) explored the motivations of transgender officers entering the profession, revealing gender-affirming factors behind their career choices. Meanwhile, Miles-Johnson (2020) highlighted the persistent underrepresentation of transgender individuals in police forces, despite targeted recruitment efforts. These findings suggest that structural and cultural barriers continue to inhibit meaningful inclusion, raising critical questions about how law enforcement agencies can better reflect and serve diverse communities.

In conclusion, the evolving body of literature on police training reveals a dynamic and increasingly interdisciplinary field. While traditional models of instruction remain relevant, contemporary challenges—ranging from pandemics to technological disruption and social inclusion—require adaptive, evidence-based, and ethically grounded training approaches. Enhanced inter-institutional collaboration, continuous professional development, and inclusive recruitment strategies will be essential for strengthening law enforcement capacity in an increasingly complex world.

2. Methodology

Bibliometrics is the systematic analysis of academic literature using data from indexed databases. This approach offers a comprehensive overview of the structure, dynamics and performance of a given scientific field by examining publications, citation patterns and contributions by authors, institutions and countries. Bibliometric techniques have been utilised to facilitate the identification of influential works, the assessment of scientific productivity and the tracking of the evolution of research topics over time (Zupic & Čater, 2015). A primary benefit of bibliometrics is its capacity to assess scientific impact through the analysis of citation trends, thereby facilitating an informed evaluation of research performance.

Science mapping, a significant application of bibliometrics, facilitates the creation of visual diagrams that illustrate the interconnectedness of different components within a field of study. These diagrams can reveal collaborative patterns among researchers, frequently used keywords and the nature of institutional

collaboration (Van Raan, 2014). Science mapping provides a macro-level perspective on the literature, facilitating the identification of thematic clusters, emerging research areas and interdisciplinary connections that are not readily apparent in conventional literature reviews.

The present study employs a descriptive bibliometric approach with the objective of measuring and examining research outputs on police education. Bibliometrics is defined as the quantitative analysis of publications and related textual communication (Broadus, 1987). As Ellegaard and Wallin (2015) summarise, such analyses are particularly useful for identifying publication trends, author influence and citation dynamics in a given research field. Bibliometric tools also facilitate the analysis of collaborative research networks involving researchers, institutions and countries, thereby enabling the discernment of interconnections between diverse research domains through the analysis of co-occurring keywords.

This research not only assessed the growth and distribution of scientific work, but also contributed to informed decision-making in research management and educational policies. The objective of this study was to utilise science mapping techniques to create a visual and conceptual landscape of global research on police training. The primary objective of the study served as a reference point for future research, thereby highlighting critical areas for continued research and supporting strategic planning of police training initiatives.

2.1. Research Design

The analysis was conducted using the Bibliometrix package within the R programming environment. The objective of this analysis was to identify and quantify existing research on police training. The study identified key publication trends, influential studies and collaborative networks through various scholarship mapping techniques. Thematic evolution and interrelationships between studies were also explored, offering insights into the development and direction of this emerging research field.

2.2. Research Sample

The research population comprises all academic publications that examine police training. A dataset comprising 710 articles was obtained from studies indexed in the WOS database.

2.3. Data Collection Tools and Techniques

The precision and thoroughness of a bibliometric study are contingent on the selection of the database, as it directly influences the quality of the returned data and the validity of the outcomes (Moral-Munoz et al., 2020). This study selected the WoS database due to its extensive international utilisation and comprehensive indexing of peer-reviewed literature.

A significant consideration in bibliometric research is the compatibility between the selected database and the software tool utilised for analysis. In light of the program's pronounced visualisation and analytical capabilities, the Bibliometrix package was employed within the R programming environment in this particular instance. Bibliometrix is particularly well-suited for data exported from WoS, allowing for the generation of comprehensive science maps, co-authorship networks and keyword co-occurrence analyses. This alignment is pivotal in ensuring that the data can be processed and interpreted within the methodological framework of the study.

2.4. Data Collection Process

For the present study, data were accessed through the WoS platform using the institutional subscription of Karamanoğlu Mehmetbey University, Türkiye. The advanced search feature was employed to ensure precision and relevance during the access process. The identified WoS records were exported in BibTeX format, including both full records and cited references, by selecting the Export option. The data collection process was conducted on 20th May 2025 and comprised the systematic filtration and download of pertinent literature for bibliometric analysis. The following parameters were determined for the database search:

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(ALL=("POLICE TRAINING" OR "POLICE EDUCATION")) AND ((DT=("ARTICLE") AND LA=("ENGLISH")) NOT (DT=("REVIEW" OR "EARLY ACCESS") OR DT=("PROCEEDINGS PAPER" OR "BOOK CHAPTER")))
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In this study, a total of 710 research publications on police training were retrieved from the WOS Core Collection database.

2.5. Data Analysis

The utilisation of specialised bibliometric software tools is imperative for the effective processing and analysis of data from WoS. These tools facilitate both performance analysis and science mapping, thereby providing comprehensive insights into the structure and evolution of research fields. In this study, the bibliometrix package developed by Aria and Cuccurullo (2017) and implemented in the R programming environment was utilised for the analysis. The results were then processed and visualised through the user-friendly Biblioshiny interface, which provides interactive dashboards for data exploration.

In the selection of publications on police training, specific inclusion and exclusion criteria were applied in order to maintain the relevance and quality of the resulting dataset.

Inclusion Criteria

- Indexed in the WoS database
- Published in English
- Classified as a research paper (excluding other document types)

Exclusion Criteria

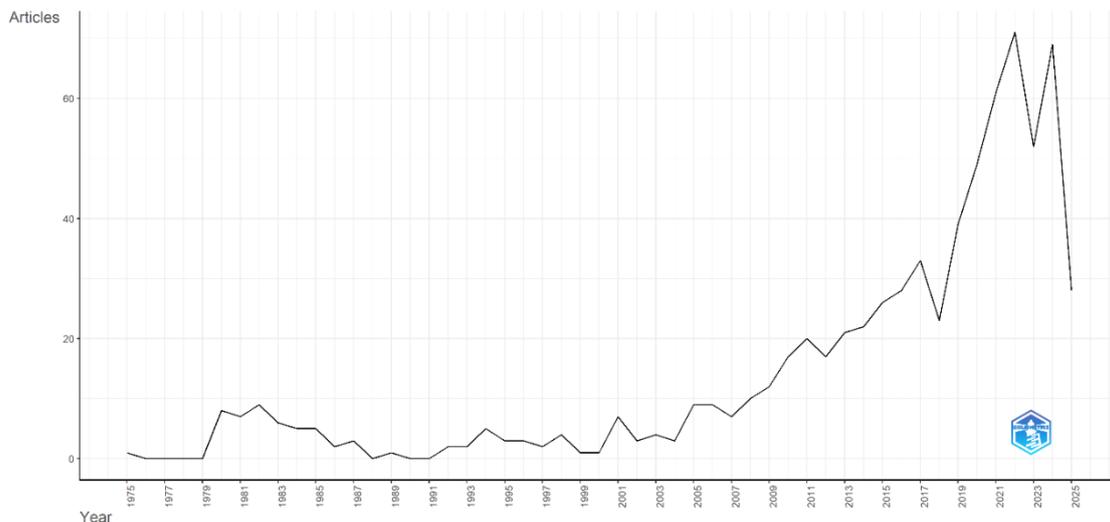
- Publications are not in English.
- Non-article formats such as books, review articles, early access articles, conference proceedings, book chapters or technical reports

3. Finding

This section presents the research findings in the form of subheadings, organised according to the research questions.

3.1. Descriptive Findings

Police training has featured in the literature indexed in the WoS database since 1975 (see Graphic 1).



Graphic 1. Annual Scientific Production

It is evident that the number of relevant publications fluctuated from 1975 to 2025. However, a significant growth and steady increase was recorded from 2018 to 2022. The year 2022 has been identified as the one in which the highest number of publications was achieved.

The main general information of the study is presented in Figure 1.



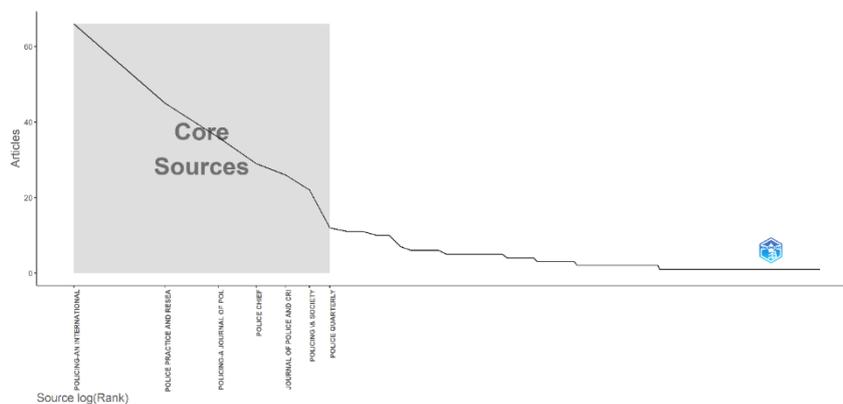
Figure 1. Descriptive Bibliometric Indicators of Police Training Research

The dataset under consideration here spans a substantial period from 1975 to 2025, encompassing a total of 710 documents sourced from 292 different journals, books and other academic outlets. The field exhibits a healthy annual growth rate of 6.89%, with the average document being approximately 10.1 years old. The mean citation rate for documents was found to be approximately 13.01, indicating a moderate academic impact. The total number of references cited across all documents was 25,116, indicating a robust foundation in extant literature. In terms of content, the documents include a rich variety of indexed terms, with 1,157 Keywords Plus and 1,733 author-provided keywords.

The analysis of the authorship data reveals contributions from 1,933 unique authors, of which 159 have authored single-authored papers. A total of 181 documents were authored by a single individual, with an average of 3.34 co-authors per document. This finding suggests a collaborative research environment. It is noteworthy that 15.07% of the publications involve international co-authorship, indicating a substantial degree of global collaboration. The 710 documents are uniformly classified as articles, thereby indicating that the dataset is composed exclusively of peer-reviewed scholarly work.

The data indicated that the field is evolving rapidly and is characterised by a strong collaborative spirit and a significant base of scholarly engagement. The reasons for this remarkable growth include the increasing number of researchers and the facilitating effects of emerging technologies on research, as observed by Aria et al. (2020) and Merigó et al. (2015).

Graphic 2 analyses the bibliometric profile of the field of police education by applying Bradford's Law. The graph reveals the structural characteristics of the literature by categorising the distribution of academic publications in the field into three main regions (core, middle and periphery).

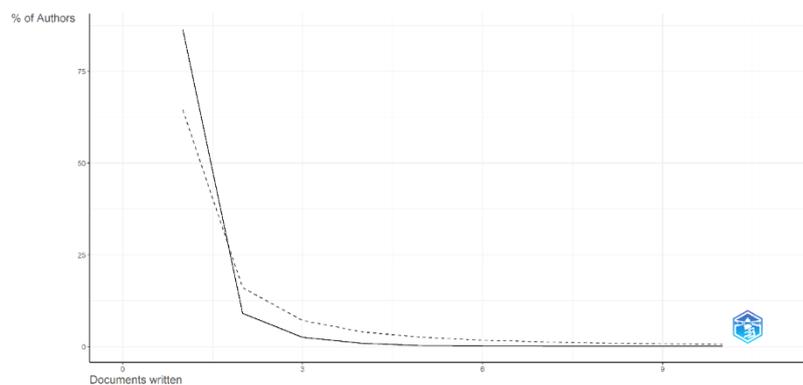


Graphic 2. Core Sources by Bradford's Law

In accordance with the three-region distribution model predicted by the Bradford's Law, it is evident that the police education literature is predominantly influenced by a select group of publications. It reveals that notable academic journals within the field, including "Policing-An International Journal", "Police Practice and Research" and "Policing-A Journal of Policy and Practice", account for a substantial proportion of the extant academic production.

The findings indicated that knowledge production in the field of police education is concentrated in a relatively limited number of specialised journals. This distribution, which is indicative of the maturity level of the field, also serve as a practical guide for researchers in terms of identifying the main sources. Further results showed that researchers can enhance the efficiency of their time and resource allocation by concentrating on core journals. This bibliometric profile makes a significant contribution to understanding the dynamics of academic publishing in the field of police education and provides a methodological basis for future research.

Graph 3 presents the results of an R Studio output analysis, which examines author productivity in the field of police education in the context of Lotka's Law.



Graphic 3. Author Productivity Through Lotka's Law

As demonstrated in Graph 3, the majority of authors (approximately 75%) have authored only one or two articles, while a very small percentage (probably less than 5-10%) appear to have authored a substantial number of articles (left side of the graph). This distribution suggests that the field of Police Education is dominated by "one-off" authors, but that a small number of key authors have a significant impact on the literature. This structure of the field may be indicative of two things: firstly, that police education research is still in its maturing stage; secondly, that interdisciplinary involvement is widespread.

The findings demonstrated the validity of Lotka's Law in this domain, thereby reflecting the uneven distribution of scientific productivity and providing a significant framework for understanding publication trends within the field. Furthermore, the top ten authors in the dataset were assessed according to their h-index, which measures the academic impact of their publications in the analysed collection. The results of this analysis are presented in Table 1, which highlights the most influential contributors to the emerging field of police education research.

Table 1. Authors' Local Impact

Author	h index	g index	m index	TC	NP	PY
R. R. D., Oudejans	10	10	0.588	315	10	2009
L., Beletsky	6	10	0.400	232	10	2011
S., Karp	6	7	0.400	102	7	2011
M. D., Schlosser	6	6	0.462	103	6	2013
S. A., Steffanie	6	8	0.400	153	8	2011
L., Kleygrewe	5	5	1.000	173	5	2021
O., Rantatalo	5	6	0.500	71	6	2016
D., Sjoberg	5	7	0.417	61	8	2014
D., Abramovitz	4	7	0.364	98	7	2015
J. P. andersen	4	4	0.364	110	4	2015

*TC: Total citations, NP: Number of publications, PY: Publish year

Table 1, the data has been organised according to the h-index, which is regarded as one of the three key metrics utilised to assess the academic performance of authors. The h-index, defined as the number of highly cited papers an author has published, functions as an indicator of an author's influential and widely recognised works. In this table, the authors with the highest h-index are positioned at the summit.

It is evident that “Oudejans” (h-index: 10) is the author who has achieved the highest h-index. This indicates that a minimum of 10 articles have been cited 10 times or more. The total number of citations of the author’s work is 315 and he has published 10 academic papers. The author commenced his publishing career in 2009, thus indicating that his professional trajectory has spanned approximately 16 years. During this period, he has exerted a substantial influence within his field. “Beletsky” is another significant author, with an h-index of 6. He has received 232 citations and published 10 scholarly works. This is a reliable indicator of his academic productivity and impact. The temporal extent of his career, which commenced in 2011, serves to underscore the gradual nature of his impact.

“Karp” and “Schlosser” are authors with h-index: 6 each. “Karp” has 7 publications and 102 citations, while “Schlosser” has 6 publications and 103 citations. Both authors have made a certain academic impact, but this impact seems to have been more limited. “Strathdee” performs at a medium level with a de h-index: 6. He has 8 publications and 153 citations, indicating that he has established himself in a certain sphere of influence.

It is notable that both “Kleygrewe” (h-index: 5) and “Rantatalo” (h-index: 5) are comparatively junior members of the academic community, suggesting that they may have recently embarked upon their academic careers. However, an examination of Kleygrewe’s m-index reveals a remarkably elevated value of 1,000, suggesting that his publication is distinguished by a notably high level of productivity. Given that his career commenced in 2021, it is conceivable that he will achieve higher h-indexes in the future.

As demonstrated in Figure 1, “Sjoberg” (h-index: 5) and “Abramovitz” (h-index: 4) both demonstrate rising performance. The publication history of “Sjoberg” includes a total of eight publications, with a further 61 citations recorded. Abramovitz’s publication record comprises seven publications and has been cited a total of 98 times. Despite the authors in question having published extensively, they have yet to attain the level of distinction in terms of h-index that is characteristic of the leading authors. As indicated in Figure 1, “Andersen” (h-index: 4) has published a lower number of articles and is positioned at the bottom of the ranking, with a total of 4 publications. Despite having received 110 citations, the overall productivity of the profile is low.

3.2. Conceptual Findings

Figure 2 presents the conceptual structure of the police training literature using document coupling. The clustering analysis was performed using the Walktrap algorithm on 250 units, with a minimum frequency threshold of 5 applied.

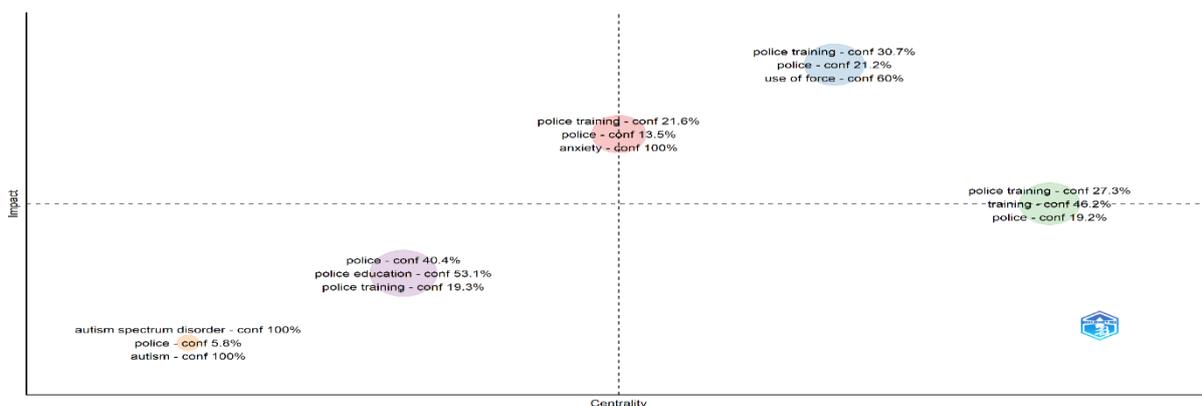


Figure 2. Clustering by Coupling

Figure 2 examines the conceptual relationships in the police training literature through document matching. The results of the analysis indicate that the extant literature is clearly clustered around three main research foci. Firstly, the cluster formed by the concepts of “police training” with a 30.7% linkage rate and “use of force” with a 60% confidence level reflects the importance the field attaches to operational skills training. Secondly, the cluster consisting of the concepts of “anxiety” and “autism spectrum disorder” with 100% connectivity reflects the growing academic interest in the psychological and neurodiversity dimensions of police training. The third main cluster is shaped around the concepts of “police training” and “police”, with a 53.1% connection rate and sheds light on the institutional dimension of vocational training. This clustering analysis, conducted with the Walktrap algorithm, reveals that police training research is becoming more complex and multidimensional and that studies focusing on special conditions, such as autism spectrum disorder, constitute a new research trend in the field.

These findings indicated that the police training literature is expanding to include both operational and psychosocial dimensions and that a conceptual framework for future research is being provided. Figure 3 analyses research trends in the field of police education through author keywords and visualises four thematic categories (Motor Themes, Basic Themes, Niche Themes and Emerging/Declining Themes). The map has been created using the Walktrap algorithm. This reveals the current research foci, emerging trends and declining areas of interest in the field.

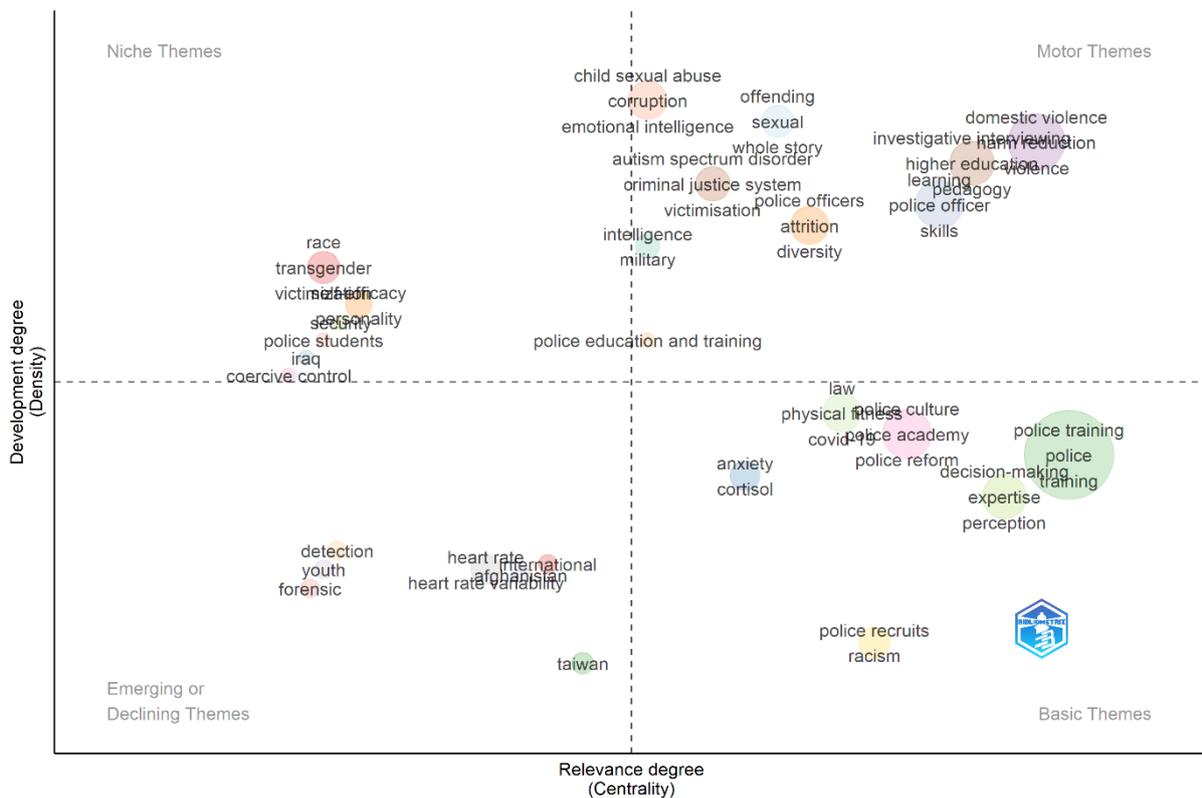


Figure 3. Thematic Analysis of Research on Police Education

The following themes are of particular significance in the field of police training literature; “motor themes” (high centrality and intensity). These themes represent the most active and influential areas of research. The terms “domestic violence” and “investigative intervention” are defined as follows: This research focuses on an important aspect of policing practice. The terms “higher education” and “police officer skills”, the emphasis is placed on the academic and professional development dimensions of police education. These themes reflect the most significant and enduring research trends in the field.

“Basic Themes” (High Centrality, Low Intensity); the subjects contained within this category constitute the fundamental concepts of police education literature; however, they have yet to be fully developed and refined.

The subjects of “police reform” and “decision-making” are discussed. This term refers to political and strategic changes in policing practices. The terms “racism” and “police recruits” are employed. This finding suggests that issues of social justice and diversity are gaining importance in training processes.

The following themes were identified as areas of particular interest within the field, “Niche Themes” (High Intensity, Low Centrality). It should be noted that these themes are yet to be fully established in the mainstream literature. The terms “race”, “transgender”, “transgender people” and “victim efficacy” are employed in this text. This phenomenon is indicative of the mounting academic interest in marginalised groups within the context of police-community interactions. The concepts of “heart rate variability” and “coercive control” are discussed in this text. The present study demonstrated the integration of psychophysiological and behavioural research into police training.

“Emerging/Declining Themes” (Low Centrality and Intensity); topics in this category can be considered as emerging new trends or declining areas of interest: “COVID”, “anxiety”, “law”: The focus is on the psychological and legal dimensions of police training in the post-pandemic period. “Child sexual abuse” and “corruption”: Important topics, but receiving fluctuating attention in the literature.

Figure 4 undertakes an analysis of the thematic changes in police training literature in the 1975-2019 and 2020-2025 periods, employing the Walktrap algorithm. Drawing upon the findings from the 2019 cross-sectional year, this analysis elucidates the evolution of research paradigms within the field.

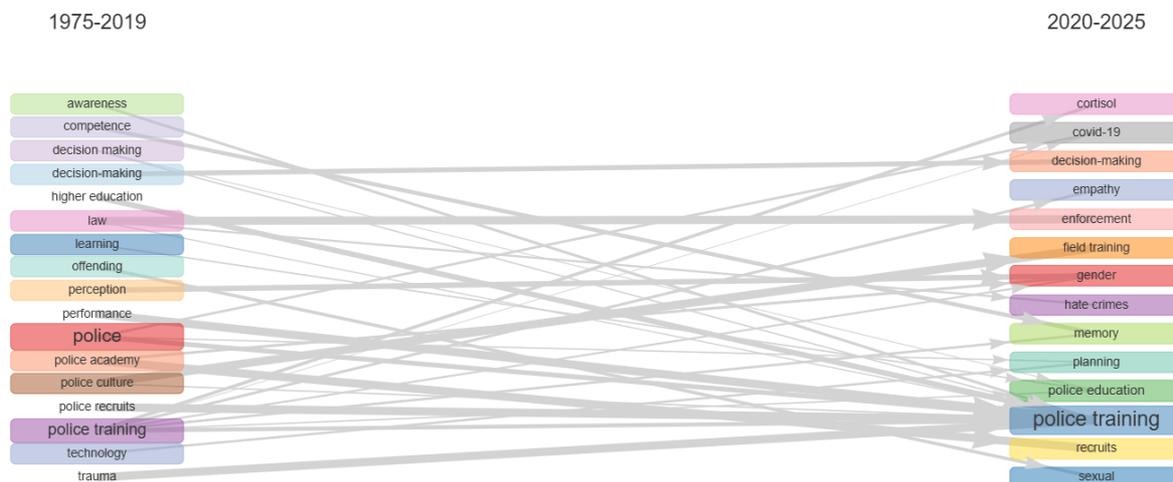


Figure 4. Thematic Evolution within Police Education

In the “Traditional Period (1975-2019)”, the focus was on operational and institutional aspects, with a particular emphasis on technical skills such as “police training” and “performance”. The legal dimension encompasses the concepts of “law” and “offending”. The concept of organisational culture is further subdivided into specific areas of focus, including, but not limited to, “police culture” and “police academy”. Cognitive processes, such as “decision-making” and “perception”, are also involved. A distinctive feature of this period is the focus on the core functional aspects of police education (law enforcement, decision-making, technical training). The focus on “higher education” signifies the progression towards academic specialisation in vocational training.

The “Modern Era (2020-2025)” will see the impact of the pandemic and social transformation on salient themes of the post-pandemic era. The repercussions of the global crisis on the subjects of “Covid-19” and “control” are of particular interest. The following social sensitivities are to be considered: “gender” and “empathy”. The term “operational adaptation” is employed to denote the process of training that is undertaken in situ, i.e. “field training” or “enforcement”. New forms of criminality have emerged, such as so-called “taste crimes” and “sexual crimes”.

The transition from the concept of “trauma” to that of “empathy” signifies a shift in psychological emphasis towards victim-oriented approaches. The substitution of “technology” with “planning” signifies that digitalisation has acquired a strategic dimension. The ongoing enrolment of new police recruits serves to underscore the significance of the selection processes employed by police departments.

It is evident that there are two overarching themes that have been consistently identified throughout the discourse, namely, “police training” and “police training”, which have been identified as being of central importance. The concept of “decision-making” has undergone significant transformation in the digital era. Examples of radical change include the transition from “awareness” to “empathy”, signifying an evolution from cognitive awareness to emotional intelligence. The concept of “competence” is understood to imply the transition from a state of theoretical proficiency to one of practical adaptability, which is facilitated by field training.

3.3. Intellectual finding

Figure 5 examines the intellectual connections between authors in the police education literature through co-citation network analysis. In the analysis parameters, it is evident that the “Authors” option has been designated as the “Field”. This signifies that the authors are the fundamental unit of analysis and the data are evaluated in accordance with this framework. The separation of the data is achieved by the use of the character “;” (semicolon), which serves to distinguish each author. In the section pertaining to network structure and clustering, the automatic layout option was selected for the purpose of optimising the positioning of the nodes by means of the algorithm.

The “Walktrap” method was utilised as the clustering algorithm, an efficient technique that groups similar nodes based on random walks. In accordance with the objective of the analysis to encompass solely those authors exhibiting substantial connections, nodes characterised by a minimum of two edges (connections) were eliminated from the network. In terms of visual parameters, short labels and small sizes (cex=2) were utilised to enhance the readability of the labels. Each node represents an author and is designed as a circle. Additionally, the repulsion force between nodes was set to a relatively low value (e.g. 0.1), indicating a predilection for a structure in which nodes can be positioned in closer proximity to each other.

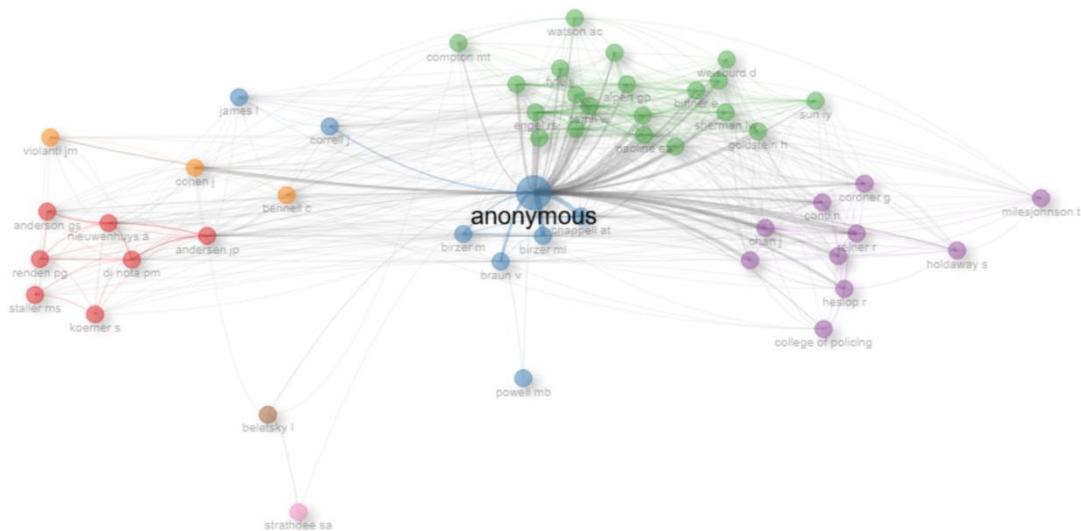


Figure 5. Police Education through Co-Citation Network

The diagram incorporates the nomenclature of various authors, institutions and research groups. Prominent names include “wazon”, “compatrii” and “violantii”. Among the actors are “jamesi”, “zabore”, “anderson” and “anonymous”. It has also been observed that academic and professional institutions, such as the “College of Policing”, are included in the network.

The utilisation of such networks is for the purpose of visualising scientific collaborations, interdisciplinary studies, or intellectual interactions within a specific research domain. The presence of a tag such as “anonymous” may be indicative of the submission of contributions anonymously or without author information. The presence of names such as “bazar” and “bazar” may be indicative of members belonging to the same research group or collaborating with one another.

The precise interpretation of the diagram is contingent on the density and configuration of the connections between nodes. To illustrate this point, consider the potential of a node in the centre to signify a seminal study within the field. However, due to the absence of lines denoting connections in the provided image, a precise interpretation is challenging. Consequently, the incorporation of supplementary information, such as the specific research question this network addresses or the underlying dataset, would enhance the interpretative value of the analysis.

Figure 6 employs the methodology of historiographic analysis to present the seminal studies in the domain of police education and their chronological relationships. In the analysis, 20 nodes labelled in the “Short ID (1st Author, Year)” format were utilised, with isolated nodes being removed to provide a clearer visualisation. The size of the nodes was set to 4 and the label size to 3.

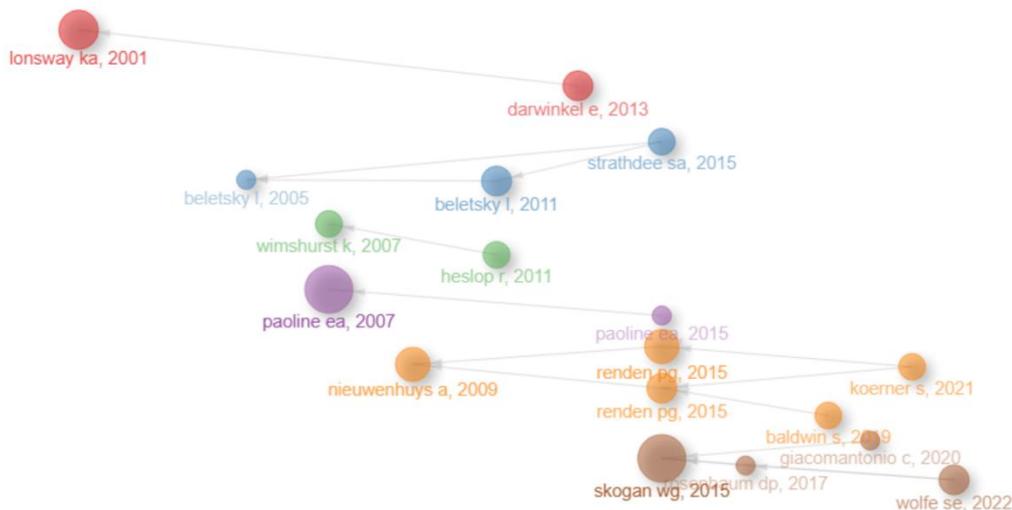


Figure 6. Historiographic Analysis Police Training Police Education

The studies included in the present list are distributed over a range of years (2001-2022) and authors. For instance, certain authors, including Beletsky (2005, 2011) and Paoline (2007, 2015), have multiple studies dedicated to their work, while others have been covered by a single study. It is notable that certain studies have been replicated, including Renden (2015), which may imply that these studies occupy a pivotal position within the bibliometric network.

This visualisation facilitates comprehension of the interaction and connections between specific authors and studies in the field. It is evident that authors who have published multiple studies can be regarded as prominent figures within the research field.

3.4. Social Finding

Figure 7 examines the collaboration network between police education researchers. The network map created with the Walktrap algorithm was analysed over 50 nodes and a minimum threshold of 1 edge.

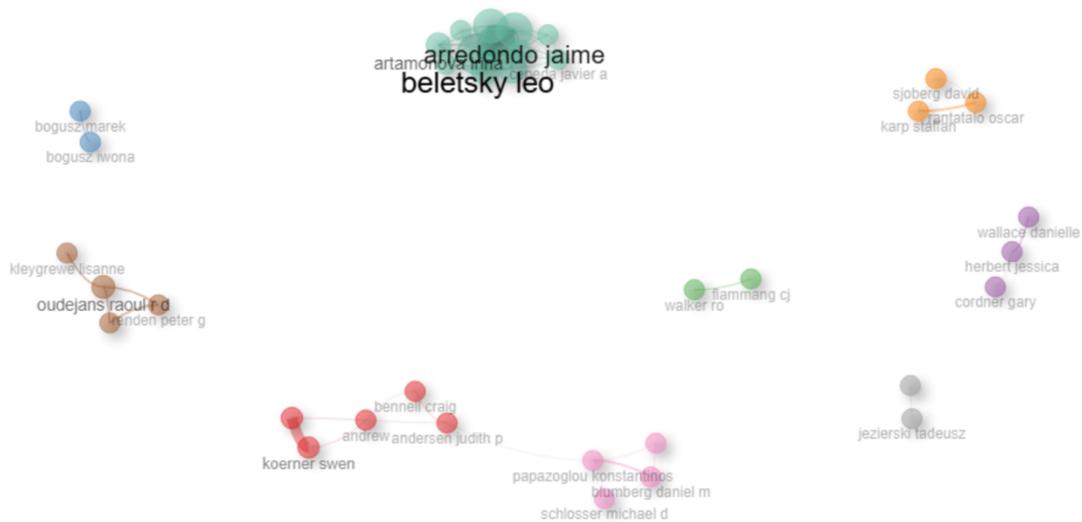


Figure 7. Collaboration Network Police Education Researchers

The network structure reflects interactions between researchers, including joint publications, projects and interdisciplinary work. This structure is indicative of both the intensity of research collaborations and the dissemination of scientific knowledge. Interdisciplinary teams are a particularly salient example of these interactions. For instance, groups of researchers such as “rantatalo”, “sjoberg” and “karp” demonstrate how diverse areas of expertise converge to make multifaceted contributions to police education. Such teams may be distinguished by their methodological diversity or comparative approach. In a similar vein, the collaboration of international researchers, including “Strathdee”, “Beletsky” and “Arredondo”, indicates a joint undertaking of research on a wide range of subjects, including global health, public safety and social policy.

Conversely, certain bilateral groups within the network structure provide more specialised and targeted research representation. For instance, pairs such as “adamkiewicz” and “jezierski” may be oriented towards quantitative work in specific sub-disciplines, such as forensic science or psychology. It is posited that researchers such as “walker” and “flammang” may represent nascent collaborations or pilot projects that are still in their early stages.

It is evident that certain researchers situated at the core of the network assume a pivotal function in the dissemination of information. Groups of three or more researchers, such as “bennell”, “andersen” and “koerner”, can act as conduits in the scientific communication network, thereby facilitating connections between different subgroups. Furthermore, they may also have strong relationships with leading institutions in the field. Conversely, groups such as “cordner”, “herbert” and “wallace” may make conceptual contributions to the academic literature, focusing on qualitative work such as theoretical framing or policy development.

Figure 8 provides a visual representation of international research collaborations in the domain of Police Education, utilising geographic network analysis capabilities. The visualisation in question, which was created with a minimum connection threshold of 2 and edge thickness parameters of 5 units, reflects academic relationships on a global scale.

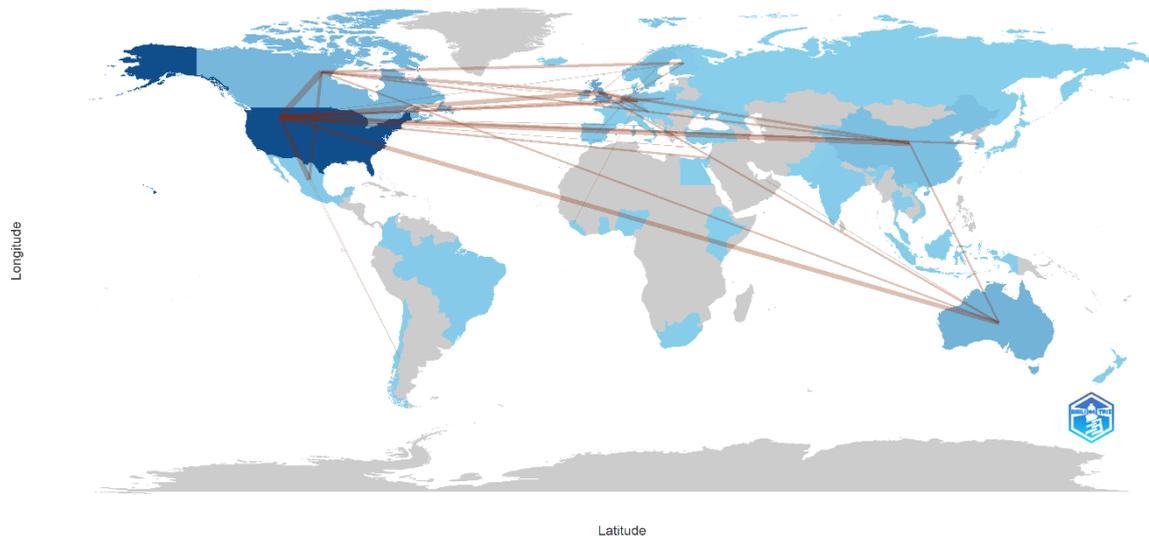


Figure 8. Mapping International Research Collaborations in Police Education

The primary findings indicate that patterns of global collaboration are evident in the domain of police education research. In this context, it is particularly noteworthy that Western countries such as the USA, the UK, Canada and Australia are positioned at the centre of the network (Figure 8). This predominance can be primarily attributed to the preeminent status of English in academic discourse and the advanced framework for police education research in these nations. However, as highlighted in the abstract, this central positioning underscores a “Western-centric bias” This bias may lead to the 'intellectual colonization' of the field, where training reforms in developing nations are modeled strictly after Western systems without adequate empirical validation in those local contexts. To mitigate these negative impacts, there is a critical need for more diverse geographical participation to ensure that police education literature becomes truly global and inclusive. This predominance of Western nations in research networks reinforces the aforementioned bias. It poses a risk of 'intellectual colonization,' where Western police training reforms are exported to diverse geographies without sufficient local empirical validation. For a more inclusive global literature, there is a critical need to integrate perspectives from non-Western contexts to prevent the field from being limited to a single cultural paradigm.

Conversely, there are some emerging models of cooperation that present an alternative to the traditional Western-centred structure. Notably, the emergence of South-South collaborations between countries such as Brazil, South Africa and India signifies the development of novel and diverse research perspectives. Furthermore, the enhancement of academic collaborations between nations in the Asia-Pacific region, exemplified by Singapore and South Korea, can be regarded as an indication of the mounting academic interest in the modernisation of police education in these regions. The findings indicate an evolution of global research networks in the field of police education towards a more diverse and balanced structure.

4. Discussions and Conclusion

Upon evaluation of the results of the common word analysis obtained from the research findings, it becomes evident that the clusters exhibit divergent approaches in the police education literature. However, the limited number of nodes in the clusters indicates that certain universities within the domain of police education have yet to be thoroughly delineated in the context of social structure and level of influence.

A substantial increase in the number of articles was observed, particularly between 2020 and 2024. The year 2022 has been identified as the one in which the highest number of articles were recorded (71), followed by 2024 (69) and 2021 (61). This indicates an augmented level of academic interest in police training, accompanied by a notable escalation in research activity in recent years. However, the number of articles fluctuated between 17 and 39 in the period 2010-2019, and remained relatively low (mainly below 10) in the early 2000s and 1990s. This finding suggests that the field of police education research has evolved into a

relatively recent area of academic interest. The present study indicates that there has been a marked increase in the publication of literature pertaining to police education, with a particularly notable acceleration occurring within the last five years. The following factors may be considered as the potential causes of this increase: the diversification of global security challenges; the necessity for the professionalisation of the police profession; and the impact of technological developments on training methodologies.

Notable academic journals within the domain of police education include “Policing: An International Journal”, “Police Practice and Research”, “Policing: A Journal of Policy and Practice”, “Journal of Police and Criminal Psychology” and “Police Quarterly”. These journals occupy a central position within the relevant literature as the most influential and frequently cited sources in the field. The application of the Bradford’s Law to police training enables researchers to focus on the most productive sources of information. For instance, it can be hypothesised that articles published in prominent journals are more reliable in terms of methodological rigour and theoretical depth.

In the context of evaluating academic productivity within the domain of police education, it is imperative to enhance the calibre of authors, particularly those who disseminate monographs. In order to facilitate the attainment of academic depth in the oeuvre of such authors, it would be advantageous to disseminate training programmes with a focus on methodology and to encourage the establishment of academic mentoring programmes. Conversely, Lotka’s Law elucidates that a limited number of prolific authors wield a substantial influence within the literary landscape.

Collaborations between these authors and experts from different disciplines, including sociology, psychology and cybersecurity, have the potential to make significant contributions to the scientific development of the field. Lotka’s Law unequivocally illustrates the conspicuous disparity in productivity within the domain of police education literature. Despite the fact that this imbalance is partly attributable to the practice-oriented nature of the field, there is a possibility of increasing academic continuity through the implementation of policies such as publication incentives, co-citation networks and research support programmes.

“Oudejans” is one of the researchers with the highest impact level in the field of police education literature. The author, who is distinguished by both an h-index (10) and a g-index (10), has garnered attention on account of his sustained academic productivity since 2009. The m-index of 0.588 demonstrates that this continuity has evolved into a stable effect. The fact that he has received 315 citations in total is indicative of the significant influence his work has had on the field, as well as its widespread utilisation. Oudejans’ most prominent feature is his long-term and consistent academic contributions. The significant disparity between the “Beletsky” g-index (10) and h-index (6) indicates that the individual in question has achieved notable prominence in the academic literature, primarily through a limited number of highly cited articles. The 232 citations that he has received are indicative of the breadth of his impact. A salient feature of Beletsky’s oeuvre is the considerable influence exerted by a select number of his works, which have significantly elevated his scientific visibility.

Conversely, “Kleygrewe” exhibits an ascending academic profile as the author with the highest m-index value (1.0). The author has published five academic papers and has been cited 173 times in a relatively short period of time since 2021. This indicates both his recent productivity and the rapid impact of his work. This suggests that Kleygrewe has the potential to become one of the leading researchers in the field in the future. The subject’s most salient feature is his high academic impact and rapid rise in a relatively brief period. In order to ensure the ongoing development of academic research in the domain of police education, it is imperative to provide sustained support to authors who demonstrate a commitment to long-term impact. It is imperative to provide support for researchers such as Oudejans, who have demonstrated consistent productivity over the years. Doing so will serve to strengthen the theoretical foundations of the field and ensure scientific continuity.

Nevertheless, monitoring the latest generation of researchers is also of critical importance in order to facilitate understanding of future trends. For instance, the oeuvre of nascent authors such as Kleygrewe can serve as a barometer for the progression of the field by placing emphasis on contemporary themes such as technology integration or crisis management in police education. Conversely, it is imperative to diversify the citation

structures employed in the extant literature. As evidenced by the case of Beletsky, elevated g-index values can result in an overreliance on specific studies, which poses a risk of fostering a narrow perspective within the literature. Consequently, the promotion of a more balanced citation structure is imperative. Finally, it should be noted that academic performance should be assessed according to career stage. In this context, indicators such as the m-index can provide a more equitable means of gauging the potential of early career researchers and contributing to the development of support policies for these researchers.

The Clustering by Coupling analysis has identified three main clusters that are particularly salient in the domain of police training literature. The initial cluster, designated as the Psychological Preparedness Cluster, exhibits a 100% confidence level correlation between anxiety management and police training. This finding indicates that effective stress management is a critical component of operational readiness. The direct link to police training is 21.6%, suggesting that this cluster requires stronger integration of psychoeducational components into the curriculum. Secondly, within the Operational Skills Cluster, the use of force was linked to police training by 60%. This link underscores the significance of tactical decision-making training, particularly in the context of professional development. The 30.7% association with police training indicates that the curriculum content in this area needs to be more systematised. The third cluster, designated the Special Group Training Cluster, has been demonstrated to exhibit a 100% association with autism spectrum disorder. However, the correlation to police training is only 5.8%, indicating a substantial lacuna in the extant literature and training content in this area.

This finding suggests a need for further investigation into the efficacy of training in enabling police officers to communicate effectively with individuals who experience neurodiversity. In consideration of the aforementioned analysis, four primary conclusions were derived. Firstly, psychoeducational integration is critical. The robust correlation between anxiety management and police training indicates a necessity for the explicit integration of stress coping skills into the curriculum. In this context, it is recommended to increase the number of modules that develop psychological resilience, especially in simulation-based training. Secondly, there is a need to restructure tactical decision-making training in line with the moderate link with the use of force. The integration of case studies, ethical dilemmas and decision-making scenarios within training curricula is poised to enhance police candidates' capacity for deliberate and conscientious decision-making in real-world scenarios. Thirdly, with regard to communication with special groups, topics such as autism spectrum and anxiety receive insufficient attention in police training.

Consequently, there is a pressing need to develop neurodiversity-sensitive communication techniques, simulated interaction scenarios and special protocols. Interdisciplinary research, for example in the fields of psychiatry, neurology and forensic sciences, should be encouraged, especially in areas that have received insufficient research attention, such as autism, anxiety and police interaction. The findings of these studies will contribute to the enhancement of police training programmes, ensuring their greater inclusivity, scientific rigour, and substantial social impact. In accordance with these findings, a comprehensive restructuring of police training programmes is recommended, with the objective of incorporating the interactions between components. This approach is expected to enhance operational effectiveness and substantially improve the quality of interaction with society.

A thematic analysis of police training literature reveals that research is developing in both traditional and innovative areas. Within the domain of niche themes, subjects such as child sexual abuse and autism spectrum disorder exemplify areas that necessitate specialised knowledge and sensitivity. These findings suggest the necessity for novel training methodologies to facilitate effective communication among police officers and certain demographic groups. Themes that are emerging or waning are shaped by the social and health-related dynamics of the period. The impact of the pandemic on police academies and anxiety management is reflected in new research agendas that have come to the fore in the post-pandemic period. Topics such as police reform and racism reveal the effects of global social movements on police training.

Concurrently, technology-based subjects such as physical culture and heart rate monitoring demonstrate the adoption of innovative approaches in training methodologies. Furthermore, subjects such as police training and decision-making processes, which may be regarded as elementary themes, persist in forming the fundamental research axes of the field. Furthermore, it is imperative to emphasise that concepts such as the perception of expertise and candidate training represent pivotal areas that must be given due consideration in the process of professionalising policing as a profession. It is evident that several fundamental recommendations emerge from these findings. Firstly, it is imperative to emphasise the significance of the development of special group trainings. The creation of training modules containing special communication techniques for police officers to interact healthily with groups such as those with autism spectrum disorder and child abuse is indicated by the existence of such niche themes. Secondly, technology integration should be incorporated into training processes.

For instance, the utilisation of biometric data, such as heart rate, has the potential to enhance the efficacy of stress management training programmes by providing an objective basis for the training methodologies employed. These processes can be reinforced with realistic scenarios by supporting them with virtual reality simulations. Thirdly, close monitoring of the global agenda and curriculum updates based on it are critical needs. The integration of social themes, including but not limited to police reform and racism, into training content is a strategic approach that can enhance police organisations' sensitivity to social expectations.

Thematic analysis of the research indicates that police training should encompass two key components: the maintenance of fundamental skills and the development of flexible and innovative models capable of responding to emergent social needs. In particular, the dissemination of technology-based measurement and evaluation methods will contribute to the scientific monitoring and improvement of training effectiveness.

This thematic evolution analysis demonstrates that the education of police officers must now extend beyond the mere transmission of technical skills. It is imperative that contemporary police education adopt a scientifically based and human-centred approach that is sensitive to social changes. The themes that have emerged, especially since 2020, reflect the increasingly complex social role of the police profession. In this transformation process, it is of great importance that educational policies are designed in an evidence-based and visionary manner.

The present study proposes a co-citation network analysis as a means of strengthening the aforementioned field by concentrating the intellectual capital of the police education field around the researchers and institutions that define it. It is imperative that these communications are meticulously documented, and that new connections are facilitated, in order to ensure the progression of the field.

This Historiograph analysis demonstrates that the field of police education is in a constant state of evolution. In addition to conventional subjects, technology, psychology and social changes represent important dynamics that shape the future of police education. It is imperative that this historical background is given due consideration and substantiated by novel research in order to formulate evidence-based education policies. Recent curriculum updates in police academies have involved the integration of technology and social skills. In addition, comparative research has been undertaken with international collaborations, and applied education models have been disseminated. This analysis indicates that, in order to prepare for the future, police education must embrace innovation whilst also acknowledging and preserving its historical knowledge.

This Collaboration Network analysis demonstrates that police education research is becoming increasingly collective in nature. In order to facilitate future progress in this field, it is essential that these collaborations are managed conscientiously and that the formation of new connections is actively promoted. The integration of experts from diverse disciplinary backgrounds is expected to yield substantial contributions to the advancement of both the theoretical and practical dimensions of police education.

The analysis of the Countries' Collaboration World Map indicates that global collaboration in police education research remains predominantly Western-centric, though it possesses the capacity for diversification. The

enhancement of geographic and cultural diversity is of paramount importance to the theoretical and practical development of the field.

4.1. Limitations and Recommendations

Despite the comprehensive bibliometric and thematic analysis of police education literature that this study offers, there are several limitations that should be acknowledged. Firstly, the exclusive reliance on the WoS Core Collection may have resulted in the omission of relevant publications indexed in alternative databases, such as Scopus, ERIC, or Google Scholar. Consequently, the findings may not fully capture the breadth of global scholarship in this domain. Secondly, while bibliometric indicators such as h-index, g-index and m-index provide valuable insights into academic impact, they do not necessarily reflect the qualitative depth or practical influence of the research. Thirdly, the analysis is predominantly focused on English-language publications, thus underrepresenting non-English contributions, which may offer valuable regional perspectives, particularly from under-researched contexts.

Furthermore, while thematic clustering and co-citation analyses are statistically robust, they are inherently limited by the accuracy and consistency of keyword tagging and citation metadata. The field's practice-oriented nature and the nascent stage of academic inquiry into certain topics may further constrain generalisability.

In light of these limitations, several recommendations can be made. It is recommended that future research adopts a multi-database approach in order to ensure a more inclusive and representative literature base. The integration of qualitative content analysis could serve to complement bibliometric findings, thereby offering a more profound insight into theoretical frameworks and practical implications. Furthermore, endeavours must be undertaken to incorporate non-English language sources and underrepresented regions into the academic discourse, thereby fostering greater geographic and cultural diversity.

It is further recommended that research support policies prioritise both sustained scholarly engagement and the cultivation of early-career researchers. It is possible that this may encompass the establishment of academic mentoring schemes, the introduction of publication incentives and the facilitation of interdisciplinary collaboration opportunities. The integration of emerging technologies, including artificial intelligence and immersive simulation tools, into training curricula and academic studies has the potential to enhance the methodological and practical relevance of future research in police education.

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