Dašić, D., Vuković, M. (2024) Mixing quantitative and qualitative methods in scientific research in sports In: Dašić, D. (ed) Sporticopedia SMB2024, Vol 2, No 1, 285-298

Review
Received: 10.11.2024
Accepted: 11.12.2024

DOI: https://doi.org/10.58984/smbic240201285d

Coresponding author: dejan.dasic@fzs.edu.rs

MIXING QUANTITATIVE AND QUALITATIVE METHODS IN SCIENTIFIC RESEARCH IN SPORTS[1]

Dejan Dašić[2], Milovan Vuković[3]

Apstract: In contemporary sports research, the combination of qualitative and quantitative methods is becoming increasingly popular due to its ability to provide a more comprehensive understanding of the complexity of sports phenomena. Quantitative methods enable the collection of objective numerical data and the conduction of statistical analyses, while qualitative methods offer deeper insights into experiences, perceptions, and contexts. This paper explores various approaches to mixing these methods in sports research, analyzing the advantages and challenges this methodological approach presents. Through a literature review and case study analysis, examples of successful integration of qualitative and quantitative methods are presented, with a focus on enhancing the validity and reliability of findings. The conclusions of the paper emphasize the importance of methodological pluralism in sports research and propose guidelines for future studies aiming for a holistic understanding of sports phenomena.

Keywords: Method combination, Sports research, Quantitative methods, Qualitative methods, Methodological pluralism

[1] This paper was prepared with the fi nancial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, within the funding of scientifi c research work at the Technical Faculty in Bor, University of Belgrade, according to contract no. 451-03-65/2024-03/200131.

[2] PhD, Full professor, Faculty of Sport Belgrade, University "Union – Nikola Tesla", Belgrade, Serbia. dejan.dasic@fzs.edu.rs; https://orcid.org/0000-0002-8245-1117

[3] PhD, Full professor, Technical Faculty in Bor, University of Belgrade, Serbia; e-mail: mvukovic@tfbor.bg.ac.rs. https://orcid.org/0000-0003-1715-1078

Introduction

The research process is typically divided into a specific number of components or phases, with the number varying from author to author. Most authors in contemporary methodological literature identify several phases in scientific research (Vuković, et al., 2024).

In contemporary sports research, the combination of qualitative and quantitative methods is gaining increasing importance due to its ability to provide a more comprehensive insight into the complexity of studied phenomena (Dašić, 2023b). While quantitative methods offer objective numerical data and enable statistical analysis, qualitative methods delve into the deeper layers of human experiences, perceptions, and contexts, providing a richer understanding of the phenomena.

This integration allows researchers to overcome the limitations of individual methods, creating a methodological pluralism that enhances the validity and reliability of findings. This paper explores various approaches to mixing qualitative and quantitative methods in the context of sports research, analyzing the advantages of this approach through specific examples and case studies.

In addition to contributing to methodological diversity, the integration of these methods can potentially transform approaches to introducing innovations in sports practice and developing more effective training programs. Through a review of relevant literature and critical analysis of previous research, the aim of this paper is to highlight the importance of harmonizing qualitative and quantitative approaches as a key step toward a holistic understanding of sports phenomena.

Lierature review

The combination of qualitative and quantitative methods in sports enables a deep understanding of complex sports phenomena. Qualitative methods provide insights into athletes' subjective attitudes and behaviors, while quantitative methods facilitate the measurement and analysis of statistical data across broader populations. Together, these methods allow researchers to gain a holistic perspective on various aspects of sports, ranging from physical performance to psychological and social factors, making them indispensable tools for the advancement of sports sciences. (Onwuegbuzie, et al., 2009). Mertens (2023) highlights the transformative potential of mixed methods, emphasizing their adaptability for addressing complex challenges in sports. This approach integrates quantitative data analysis with qualitative insights to drive systemic changes, particularly in sports pedagogy and performance analytics. The research pro-

motes using mixed methods to align theoretical frameworks with real-world applications, fostering societal and educational impact. The paper (Liu, 2022) critically reviews debates surrounding the integration of qualitative and quantitative methods in mixed methods research (Table 1).

***Table 1**. Paradigmatic Differences Between Qualitative and Quantitative Research*

	Qualitative	Quantitative
Ontological orientation	Constructivism: Reality is socially constructed, context situated, and time-bounded, leading to multiple context-contingent versions.	(Post-)positivism: Reality is objective, timeless, and context-free, existing out there as external facts beyond inquirers' reach or influence.
Epistemological orientation	Driven by their subjectivities, researchers interact with the researched phenomenon and stand inside the research process.	Holding an independent stance, researchers distance themselves from the researched phenomenon and search for objectivity as a regulatory ideal during the research process.
Methodological orientation	Researchers function as a research instrument and adopt the hermeneutic/dialectic approach to provide detailed contextualized descriptions of the researched phenomenon. Methods used include: • Participant observation; • In-depth interviewing; • Focus groups; • Discourse analysis; • Qualitative content analysis; • Narrative analysis, etc.	Researchers begin with hypotheses and theories and employ an experimental/manipulative approach to triangulate data, hoping to test out hypotheses to wider populations. Methods include: • Experiments; • Surveys; • Quantitative content analysis; • Structured interviewing; • Structured observation etc.

Source. Liu, Y. (2022).

The author explores how different philosophical foundations, such as positivism and constructivism, influence the feasibility and effectiveness of combining methods. Strategies for navigating these challenges are proposed, and the value of epistemological flexibility is emphasized. By reviewing existing theoretical and empirical studies on mixed methods research to identify recurring themes, challenges, and potential solutions, the paper suggests that future research should focus on expanding the types of combinations, broadening the scope of literature searches, and exploring other qualitative methods, such as content analysis and behaviorist ethnography, for their application in mixed methods research.

Traditionally, a clear distinction exists between the methods applied in the natural sciences and those used in social sciences and the humanities. Natural sciences tend to favor quantitative methods, whereas social sciences, particularly psychology, human geography, and sociology, are more oriented toward qualitative approaches. However, there are notable exceptions, such as economics and significant segments of sociology, where quantitative approaches dominate.

The division between these two approaches persists despite calls from 19th-century scholars for the social sciences to adopt positivist ontology and use the same methods as the natural sciences. Durkheim, in fact, rejected all approaches except the positivist one. While key sectors within the social sciences have indeed developed along this positivist trajectory, other areas of research have continued to rely more on qualitative methods, making them more interpretative than positivist (Strijker et al., 2020).

The work of Allmark and Machaczek (2018) examines the use of realism as a philosophical foundation for mixed-methods research in healthcare. The authors explore how realism can provide an alternative framework for such research compared to pragmatism, which is traditionally regarded as the standard approach for mixed methods. The study focuses on a case involving the transfer of information between medical teams during patient handovers, investigating how the application of realism affects research design and the potential differences in outcomes if pragmatism were the primary approach.

Pragmatism is traditionally the foundation for mixed-methods research because it emphasizes practicality and the utility of findings without necessarily striving for "objective" truth. In contrast, realism assumes that reality exists independently of human perception and that research should uncover the underlying mechanisms that cause phenomena. Realism enables researchers to focus on a deeper understanding of the causes and effects of specific phenomena rather than solely on their practical outcomes. This approach provides a more coherent philosophical framework for integrating quantitative and qualitative methods, allowing for analysis grounded in complex theoretical foundations. The paper successfully argues that realism can be compatible with mixed-methods research despite the traditional dominance of pragmatism.

Some authors (Ryba et al., 2020) explore how a critical realist approach can enhance the application of mixed-methods research (MMR) in sports psychology and exercise. The authors advocate for recognizing underlying structures and mechanisms, emphasizing the need to link qualitative and quantitative methods to better understand complex psychological phenomena in sports. They highlight that although MMR in sports psychology and exercise is on the rise, limited attention has been given to its philosophical underpinnings. The authors argue that adopting a critical realist approach can bridge qualitative and quantitative methods, making them epistemologically and onto-

logically compatible. They suggest that methodological pluralism, rather than strict adherence to distinct paradigms, can improve explanatory power. Furthermore, the paper calls for more transparent reporting in MMR studies, urging researchers to consider the philosophical assumptions behind their methods to strengthen the field.

Camerino, Castaner, & Anguera (2023) present case studies in movement sciences, including team and individual sports. They showcase mixed methods to detect hidden patterns in play dynamics and optimize techniques. This study highlights how integrating motor behavior analysis with qualitative narratives enhances understanding and application in sports coaching and education.

Knowledge management in organizations represents a key function in the modern business environment, as it enables the efficient collection, sharing, use, and storage of knowledge within the organization. Given that knowledge is becoming one of the most important resources for competitiveness, organizations face challenges in effectively managing and utilizing this resource (Vučković, 2022). Through various strategies, technologies, and methods, knowledge management helps organizations improve innovation, decision-making, and operational efficiency.

Knowledge management becomes particularly significant in high-tech and dynamic industries, where the rapid adaptation and use of new information can be decisive for success. Some authors (Sedoglavich, Akoorie, Pavlovich, 2014) have explored how absorptive capacity in high-tech industries can be measured. The authors employed a methodology combining qualitative interviews and quantitative surveys to gather comprehensive data. Their findings emphasize the importance of combining both methods to gain a deeper understanding of knowledge management in organizations.

For instance, consider an analysis of the effects of introducing new technologies in athlete training, such as wearable devices for performance tracking. A quantitative approach would involve monitoring physiological parameters using wearable devices (e.g., smartwatches or heart rate monitors) to measure heart rate, calorie consumption, steps, exercise intensity, and other physiological parameters in athletes. Data collected from these devices would be analyzed to determine changes in performance, such as increased speed, endurance, or reduced recovery time over a specific period. Quantitative analysis allows for processing large amounts of data from a broad sample of athletes to identify statistically significant trends.

A qualitative approach, on the other hand, would involve in-depth interviews to understand athletes' perceptions of the usefulness of wearable devices, their impact on motivation, focus, and daily training. Researchers would observe how athletes integrate new technologies into their routines and how this affects their interactions with coaches and teammates.

By combining quantitative data on physiological parameters with qualitative insights into athletes' perceptions, researchers can draw comprehensive conclusions. For example, quantitative data might indicate improved performance, while qualitative insights could reveal potential challenges, such as over-reliance on technology or stress caused by constant performance monitoring.

This mixed-methods approach provides not only an understanding of "what" is changing (quantitative data) but also "why" and "how" these factors influence athletes (qualitative insights), contributing to the development of practical recommendations for improving training processes.

Research using mixed methods, focusing on deepening the understanding of generalized, often quantitative studies, as well as generating generalized outcomes from qualitative approaches, is particularly suitable for those segments of social sciences aiming to produce directly or indirectly applicable results for interventions and policies. The use of mixed methods becomes almost unavoidable when applying a holistic approach to a research problem, as reality is generally too complex to be explored unidimensionally.

Quantitative Research and the Sport

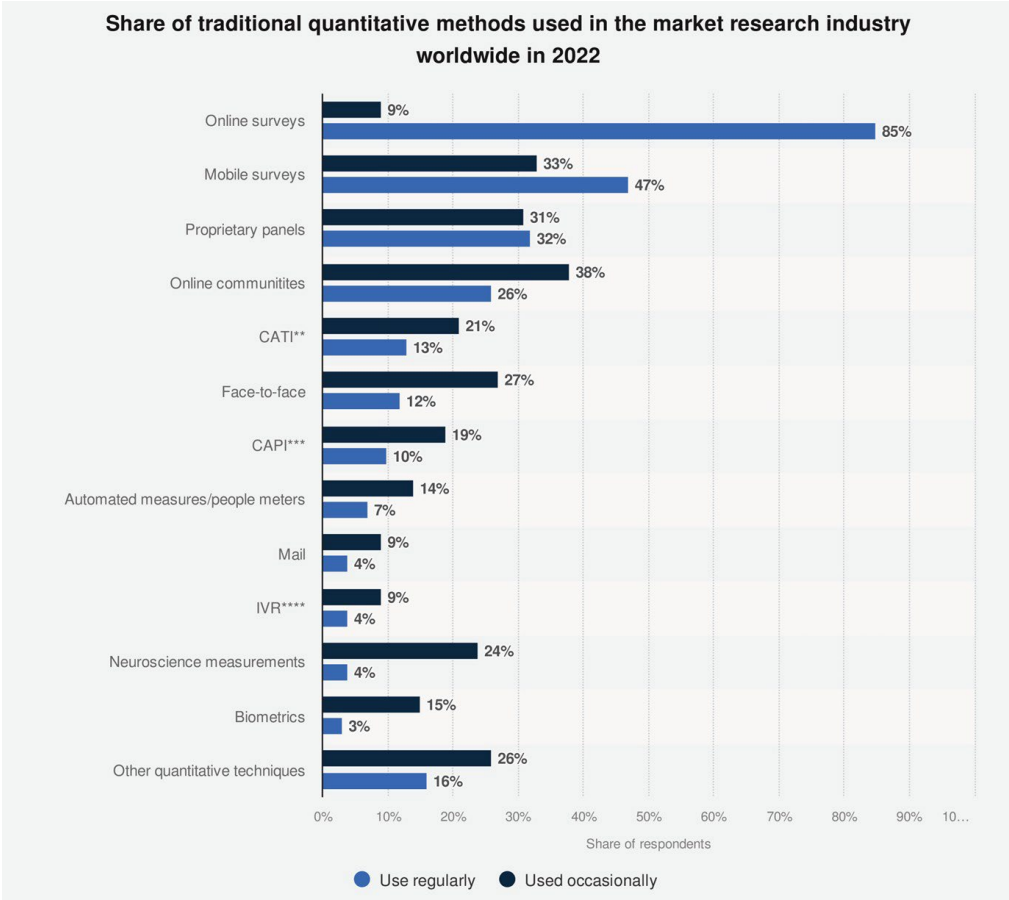
In sports and physical education research, quantitative methods play a key role in providing objective and measurable data that enable the analysis of various phenomena. These methods allow researchers to precisely quantify performance, the effects of training programs, changes in physical parameters, as well as the attitudes and opinions of athletes (Dašić, et al., 2023). By utilizing survey questionnaires, experiments, and statistical analyses, quantitative methods contribute to the improvement of training methods and the understanding of the physical, psychological, and social aspects of sports.

The most commonly used quantitative methods in sports and physical education research include:

- Surveys: Collecting data through structured questions (e.g., athlete satisfaction surveys).
- Experiments: Conducting controlled experiments to study the effects of training or therapy on physical performance.
- Statistical Analysis: Using various statistical techniques to analyze data (e.g., regression, ANOVA) to identify patterns and relationships between variables.
- Monitoring Physical Parameters: Measuring physical characteristics (e.g., body weight, running speed) through standardized tests.

In 2022, online surveys were by far the most frequently used traditional quantitative method in the market research industry worldwide. During the study, 85 percent of respondents stated that they regularly use online surveys as one of the three most common methods. Moreover, nine percent of respondents reported using online surveys only occasionally (Figure 1).

***Figure 1**. Share traditional quantitative methods in the market research industry worldwide in 2020*



Source: Bohne, 2024

Qualitative Research and the Sports

Qualitative methods are relatively scarce in public administration research. This imbalance between qualitative and quantitative methods poses three significant concerns. First, there is a risk that measurement hurdles, coupled with the distance that quantitative methodology fosters between academics and administrative practice and practitioners, undermines our inclination and capacity to study policy-meaningful research questions that matter in the real world. Second, and related, the causality underlying the real problems that policymakers and public organizations face is often much too complex to be captured by one type of methodology, whether quantitative or qualitative. Third, quantitative methodology is most conducive to testing already available theories and hypotheses, as opposed to theory building. I propose that the answer to these concerns lays in denouncing commitment to abstract philosophical divisions and advancing collaboration between qualitative and quantitative researchers and versions of mixed methods that transcend mere triangulation. These arguments are illustrated in relation to the study of bureaucratic discrimination of minorities (Gilad, 2019).

Qualitative research has emerged as a valuable methodology in the field of sports science, offering insights into the subjective and nuanced dimensions of sports participation, performance, and culture. Unlike quantitative methods that prioritize numerical data and statistical analyses, qualitative research delves into the personal experiences, perceptions, and social contexts that influence the world of sports. This approach is particularly important in exploring complex phenomena that cannot be adequately captured through purely numerical metrics, such as motivation, team dynamics, and the cultural significance of sports in various societies.

The issue of objectivity has been central to the methodology of qualitative researchin many social sciences. A sociologist, for instance, who investigates various phenomena related to sport people and sport organizations, in order to ensure objectivity, should avoid calling for a specific value, and, consequently, his/her focusshould be on “what is” instead of “what ought to be”. On the other hand, it is notpossible to neglect influence of various values in theory building. In line with this,one can conclude that objectivity should not be viewed as a sole criterion in evaluating studies of social phenomena (Vuković, et al., 2023).

In recent years, the application of qualitative methods in sports research has expanded, driven by the need to understand the human side of athletic performance and its broader implications. For example, qualitative studies have been instrumental in examining the psychological impact of injuries on athletes, the role of coaching styles in athlete development, and the barriers to sports participation among marginalized groups. Through interviews, focus groups, participant observation, and content ana-

lysis, researchers gain a deeper understanding of how athletes, coaches, and stakeholders perceive and navigate the multifaceted nature of sports.

Qualitative research also plays a critical role in addressing questions related to sports ethics, identity, and inclusivity (Mihic, et al., 2023). By capturing narratives and subjective experiences, it offers a platform to explore sensitive topics such as gender equality in sports, the influence of media on athlete representation, and the lived experiences of athletes in underrepresented communities (Vuković, et al., 2023). Moreover, this methodology complements quantitative research, enabling a holistic approach to problem-solving and theory-building in sports science.

For example, the Delphi method is a qualitative research technique often used to achieve consensus among experts in a specific field. This method is based on anonymous, iterative rounds of questionnaires, during which experts are invited to express their opinions and, after each round, to comment on the views of others. In this way, the Delphi method facilitates in-depth exploration of expert opinions and attitudes while reducing the influence of group pressure or dominant individuals (Dašić, 2023a).

Mixing qualitative and quantitative methods in sport

In sports science research, combining qualitative and quantitative methods represents a significant approach that enables a deeper understanding of various phenomena in this field. Quantitative methods provide measurable data on athletic performance, athlete health, and other quantifiable aspects, such as statistical analyses of training impacts on sports results or the effectiveness of new technologies in training.

On the other hand, qualitative methods, such as interviews with coaches and athletes or ethnographic studies in sports environments, allow for a deeper understanding of the social, psychological, and cultural aspects of sports. For instance, qualitative approaches can shed light on how team dynamics evolve during training and competition, which cannot be solely measured through numerical data.

By integrating both approaches, researchers in sports science can gain a more comprehensive understanding of complex sports phenomena. For example, quantitative analyses can confirm statistically significant trends in performance, while qualitative approaches can explain the contextual factors influencing those performances, such as athletes' mental approaches or the impact of coaching methods on motivation and team culture.

This combined approach is not only beneficial for sports science but also provides rich and deeper insights into domains requiring both qualitative and quantitative perspectives (Dašić, et al., 2024; Vuković, et al., 2024).

Consider a study aimed at determining the effects of a new training method on athlete performance. The quantitative component of the research might include measuring athletes' time, speed, and endurance before and after applying the new training method. Data such as the number of successfully completed sprints or the percentage increase in strength can be statistically analyzed to determine the method's significance.

Conversely, the qualitative component might involve interviews with athletes and coaches to understand their experiences with the new training method. For example, it could explore how athletes perceive changes in motivation, focus, or team dynamics after implementing the method. These interviews enable researchers to understand the psychological and social aspects of the new method, which cannot be uncovered through quantitative data alone.

By combining these methods, researchers can not only measure the training's effect on athletic performance but also understand how athletes subjectively experience the change and how it influences their overall training experience. Sports is of interest to scientists from various fields. When sports science is considered as a whole, there is no question of whether research in this area should be multidisciplinary and interdisciplinary in nature. As with other sciences, in sports science there is the issue of choosing scientific methods, techniques, and instruments, as well as the problem of sampling and the possibility of generalizing the results obtained (Koprivica, 2023).

Conclusion

In fan research in sports, combining qualitative and quantitative methods allows for a more comprehensive understanding of fan behavior, motivation, and attitudes. Quantitative methods, such as surveys and statistical analysis, enable the collection of large amounts of data on demographics, participation levels, and frequency of fan activities. On the other hand, qualitative methods, such as in-depth interviews and focus groups, provide a deeper understanding of the emotional and cultural aspects of the fan experience. By combining these approaches, researchers can gain detailed insights into the dynamics of fan groups, their motivational factors, and their impact on sports marketing and event management. This methodological approach facilitates the development of strategies that better meet the needs of fans, thus improving the overall sports experience and fan engagement.

Conclusions can also be drawn from different ontological, epistemological, and methodological approaches to qualitative and quantitative methods. Qualitative methods are based on a constructivist approach, which recognizes reality as socially constructed and contextually and temporally conditioned. In contrast, quantitative methods are grounded in (post)-positivism, which views reality as objective and independent of the researcher. Methodologically, qualitative approaches use interpretative techniques such as in-depth interviews and analysis, while quantitative methods apply hypotheses and experiments to test theories in broader populations.

Acknowledgement

This paper was prepared with the fi nancial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, within the funding of scientifi c research work at the Technical Faculty in Bor, University of Belgrade, according to contract no. 451-03-65/2024-03/200131.

References

1. Allmark P., Machaczek K. (2018). Realism and pragmatism in a mixed methods study. The Journal of Advanced Nursing, 74(6), 1301–1309. https://doi.org/10.1111/jan.13523
2. Bohne, R. (2024) Most used quantitative methods in the market research industry worldwide 2022. https://www.statista.com/statistics/875970/market-research-industry-use-of-traditional-quantitative-methods/
3. Camerino, O., Castaner, M., & Anguera, T. (Eds.). (2012). Mixed Methods Research in the Movement Sciences: Case Studies in Sport, Physical Education and Dance. Routledge.
4. Dašić, D., Kostadinović, G., & Kim, A. (2023). Market research as a function of marketing development in sports. SPORTICOPEDIA - SMB, 1(1), 273-283. https://doi.org/10.58984/smbic2301273d
5. Dašić, D., Ilievska Kostadinović, M., Vlajković, M., Pavlović, M. (2024) Digital literacy in the service of science and scientific knowledge. International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE), 12(1), 219-227. https://doi.org/10.23947/2334-8496-2024-12-1-219-227
6. Dašić, D. (2023b) Biographical method in research in sports. Ekonomski signali: poslovni magazin, 18(1), 53-67. DOI: 10.5937/ekonsig2301053D
7. Dašić, D. (2023a). Application of delphi method in sports. Sport, media and business, 9(1), 59-71. https://doi.org/10.58984/smb2301059d

8. Gilad, S. (2019). Mixing Qualitative and Quantitative Methods in Pursuit of Richer Answers to Real-World Questions. Public Performance & Management Review, 44(5), 1075–1099. https://doi.org/10.1080/15309576.2019.1694546
9. Koprivica, V. (2023) Pravci (putevi) razvoja nauke u sportu. U: Dašić, D. (2023) Nauka I sport- metodologija naučnog istraživanja u sportu. Službeni glasnik. Beograd. 227-234
10. Liu, Y. (2022). Paradigmatic compatibility matters: A critical review of qualitative-quantitative debate in mixed methods research. *SAGE Open, 12*(1). https://doi.org/10.1177/21582440221079922
11. Mertens, D. M. (2023). Mixed Methods Research: Research Methods. Bloomsbury Publishing.
12. Mihic, S., Dašić, D., & Bogdanova, M. (2023). Promotion of sports and fitness through health in Serbia. SPORTICOPEDIA - SMB, 1(1), 239-249. https://doi.org/10.58984/smbic2301239m
13. Onwuegbuzie, A. J; Johnson, R B. , Kathleen, C M T. (2009) Call for mixed analysis: A philosophical framework for combining qualitative and quantitative appro aches.International Journal of Multiple Research Approaches Vil.3. Issuee 2 : 114-139. https://doi.org/10.5172/mra.3.2.114
14. Ryba, T. V., Wiltshire, G., North, J., & Ronkainen, N. (2020). Developing mixed methods research in sport and exercise psychology: Potential contributions of a critical realist perspective. International Journal of Sport and Exercise Psychology, 20(24). https://doi.org/10.1080/1612197X.2020.1827002
15. Sedoglavich, V., Akoorie, M. E. M., & Pavlovich, K. (2014). Measuring absorptive capacity in high-tech companies: Mixing qualitative and quantitative methods. International Journal of Business Communication, 9(3), 367-386. https://doi.org/10.1177/1558689814523677
16. Strijker,D., Bosworth, G., Bouter, G. (2020) Research methods in rural studies: Qualitative, quantitative and mixed methods. Journal of Rural Studies, Volume 78, Pages 262-270. https://doi.org/10.1016/j.jrurstud.2020.06.007
17. Vuković, M., Dašić, D., & Vuković, A. (2024). Initial steps in preparing a scientific concept outline – formulating the problem and determining the research subject. Sport, media and business, 10(1), 75-90. https://doi.org/10.58984/smb2401075v
18. Vuković, M., Urošević, S., & Dašić, D. (2023). Threats to objectivity in the social science research. Sport, media and business, 9(2), 143-158. https://doi.org/10.58984/smb2302143v
19. Vučković, Z. (2022). Metaphorical language in specialized and popular scientific texts. Sport, media and business, 8(1), 97-113. https://doi.org/10.58984/smb2201097v

20. Vuković, M., & Dašić, D. (2024). Methodology and research methods in public relations. Ekonomski signali: poslovni magazin, 19(1), 67-87. https://doi.org/10.5937/ekonsig2401067V
21. Vuković, M., Riznić, D. & Vuković, A. (2023) The quality of higher education and strategic management. Srpska Akademska Misao, 8(1), 7-21. https://www.sam.edu.rs/index.php/sam/article/view/52