

The concept of integration in mixed methods research: a step-by-step guide using an example study in physiotherapy

Skamagki, G., King, A., Carpenter, C. & Wåhlin, C

Published PDF deposited in Coventry University's Repository

Original citation:

Skamagki, G, King, A, Carpenter, C & Wåhlin, C 2022, 'The concept of integration in mixed methods research: a step-by-step guide using an example study in physiotherapy' *Physiotherapy Theory and Practice*, vol. (In-Press), pp. (In-Press).

<https://doi.org/10.1080/09593985.2022.2120375>

DOI 10.1080/09593985.2022.2120375

ISSN 0959-3985

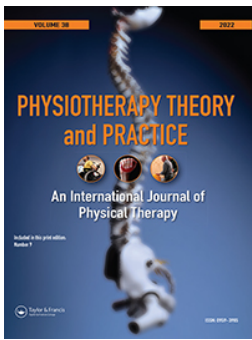
ESSN 1532-5040

Publisher: Taylor and Francis Group

© 2022 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License

(<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.



Physiotherapy Theory and Practice

An International Journal of Physical Therapy

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/iptp20>

The concept of integration in mixed methods research: a step-by-step guide using an example study in physiotherapy

Glykeria Skamagki, Andrew King, Christine Carpenter & Charlotte Wåhlin

To cite this article: Glykeria Skamagki, Andrew King, Christine Carpenter & Charlotte Wåhlin (2022): The concept of integration in mixed methods research: a step-by-step guide using an example study in physiotherapy, *Physiotherapy Theory and Practice*, DOI: [10.1080/09593985.2022.2120375](https://doi.org/10.1080/09593985.2022.2120375)

To link to this article: <https://doi.org/10.1080/09593985.2022.2120375>



© 2022 The Author(s). Published with license by Taylor & Francis Group, LLC.



Published online: 07 Sep 2022.



Submit your article to this journal [↗](#)



Article views: 165



View related articles [↗](#)



View Crossmark data [↗](#)

The concept of integration in mixed methods research: a step-by-step guide using an example study in physiotherapy

Glykeria Skamagki^a, Andrew King^b, Christine Carpenter^c, and Charlotte Wåhlin^{d,e}

^aDepartment of Physiotherapy, School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK; ^bSchool of Nursing, Midwifery and Health, Department of Physiotherapy, Coventry University, Coventry, UK; ^cDepartment of Occupational Sciences and Occupational Therapy, University of British Columbia, Vancouver, BC, Canada; ^dOccupational and Environmental Medicine Center, Department of Health, Medicine and Caring Sciences, Division of Prevention, Division of Rehabilitation and Community Medicine, Linköping University, Linköping, Sweden; ^eUnit of Intervention and Implementation Research, Institute for Environmental Medicine, Karolinska Institute, Stockholm, Sweden

ABSTRACT

Background: Integration is a unique attribute of Mixed Methods Research (MMR). However, some MMR studies, published in the field of physiotherapy and other allied health professions, have illustrated a lack of understanding of the concept of integration.

Aims: The purpose of this paper is to provide guidance for integrating elements of mixed methods research in order to effectively support evidence-based practice in health.

Methods: The concept of integration of findings is explained with reference to the author's recent PhD study, which used a mixed methods exploratory sequential design. This article describes how the author used a narrative joint display to integrate findings from both the qualitative and survey phases of the study. Then, a step-by-step approach is introduced to guide the interpretation and integration of the findings.

Results: This four-step approach demonstrates integration of the two different datasets: Creating a joint display, linking activity, establishing relationships, and interpreting and reporting. Tables and Figures are used to support detailed description and illustration of the integration process.

Discussion: A joint display provides a visual representation of how the qualitative and quantitative findings in a MMR study can be integrated. In this way, interpretation of the data drawn from this process extend beyond the individual findings of each study component to facilitate a greater understanding of complex health care issues.

ARTICLE HISTORY

Received 7 July 2022

Revised 12 August 2022

Accepted 17 August 2022

KEYWORDS


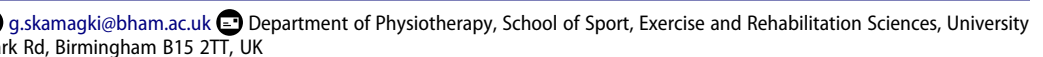
Mixed methods research; guidance; joint display; integration

Introduction

Mixed methods research (MMR) has been recognized and used as a distinct research methodology in the social and health sciences for the past 30 years. MMR involves the combination of qualitative and quantitative research methods in a single study aiming to answer complex issues (Fetters, Curry, and Creswell, 2013; Loft et al., 2018). Physiotherapy research has largely been characterized by a focus on either quantitative or qualitative methodologies. Both qualitative and quantitative researchers are concerned with transparently answering questions and using a rigorous approach to the study design to support the exploration of the facts or relationships between variables or participant experiences. However, in the last decade, MMR has been increasingly promoted within the profession in order to more effectively study the complex health issues addressed in physiotherapy practice (Rauscher and Greenfield, 2009;

Shaw, Connelly, and Zecevic, 2010; Smith, Sparkes, Phoenix, and Kirkby, 2012). In addition, health administrators and policymakers require different forms of evidence to support changes or the implementation of interventions (Creswell and Plano-Clark, 2017).

Creswell and Plano-Clark (2011) defined MMR as “a design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the data collection and analysis and the mixture of qualitative and quantitative data in a single study or series of studies.” Philosophical assumptions characteristic of pragmatism form the foundation of MMR and justify the choice of a MMR methodology in physiotherapy research (Shaw, Connelly, and Zecevic, 2010). Pragmatism has been endorsed as a philosophy that bridges ‘the gap’ between philosophers, theorists, and practitioners (Johnson and Onwuegbuzie, 2004). It reflects the connections of

CONTACT Glykeria Skamagki  g.skamagki@bham.ac.uk 

© 2022 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

knowledge, action, values, and experience, where knowledge is linked to action and is produced by experience (Bacon, 2012; Morgan, 2014). A pragmatist paradigm supports a holistic approach to physiotherapy research questions that reflect the complexity and context of physiotherapy practice (Shaw, Connelly, and Zecevic, 2010). In a practical sense, pragmatists are concerned with the reality that originates in human perception and understanding and, therefore, a variety of collection methods can effectively be employed that are usually associated with other research methodologies (Johnson and Onwuegbuzie, 2004).

Six MMR study designs have been identified which are categorized into two groups: basic and advanced designs. The advanced designs are described as intervention, social justice, and multistage evaluation design (Creswell, 2015). However, the basic designs (i.e. convergent, explanatory, and exploratory) were considered more relevant to this example study. In the convergent design, qualitative and quantitative data are collected at the same time, independently analyzed, and then merged to combine or compare the results. This design provides a comprehensive understanding of the topic of interest or a platform from which differences in the data can be identified. The explanatory sequential design involves the collection and the analysis of quantitative data to determine what results need further investigation using a qualitative research approach. In this study, an exploratory sequential MMR design was adopted. Using this design, the topic of interest is initially explored through qualitative data collection and analysis. It mainly enables information to be collected and used to develop a quantitative component that will broaden the investigation and facilitate, if required measurement of specific dimensions.

Describing a clear rationale for using MMR in physiotherapy and other health professions is key at the outset of any project. This reasoning has also been referred as 'offsetting strengths and weaknesses' (Johnson and Onwuegbuzie, 2004; Plano-Clark and Ivankova, 2016). MMR may overcome the limitations associated with adopting a single methodological approach and offset the restrictions of one approach with the strengths of another (Bryman, 2006). It can support the development of new measurement instruments and health-care policy, and the interpretation of clinical outcomes (Regnault, Willgoss, and Barbic, 2018). The integration and synthesis of findings of the different datasets can reveal novel patterns and relationships that would not have been apparent without a MMR design (Johnson and Onwuegbuzie, 2004). Rauscher and Greenfield (2009) explained that "mixed

methods research provide physical therapists with opportunities to broaden their scope and depth of understanding patients' illness, injury, and rehabilitation" and support clinical reasoning and decision-making.

An increasing number of MMR studies have been published in physiotherapy and rehabilitation journals in the past few years (McEvoy, Lewis, and Luker, 2018; Pires, Cruz, Costa, and Nunes, 2022; Pratte et al., 2018; Rodríguez-Nogueira, Moreno-Poyato, and Álvarez-Álvarez and Pinto-Carral, 2020). However, a consistent understanding of the key processes involved in MMR are not always evident in the literature (Smith, Sparkes, Phoenix, and Kirkby, 2012). In addition, published MMR studies are the subject of considerable critical debate about the philosophical underpinning of MMR, design options and possibilities and the procedural issues involved in conducting a study (Creswell and Garrett, 2008; Feters and Freshwater, 2015; O'Cathain, Murphy, and Nicholl, 2008; Shaw, Connelly, and Zecevic, 2010). It is, therefore, important that researchers' understand MMR and the complexity of designing and implementing MMR studies and, in turn, enhance their ability to contribute to the debate (Creswell, 2011; Fábregues et al., 2021).

A key challenge within MMR is how the different methods and data sets are integrated, that is, synthesized or brought together (Åkerblad, Seppänen-Järvelä, and Haapakoski, 2020). Integration is a unique attribute of MMR as researchers do not conceptualize, conduct, and report the components separately but intentionally combine them as a whole study. Creamer (2018) suggested that integration is a dynamic and interactive process within the specific mixed-method design. This process is "an approach where there is the intention to mix or integrate the qualitative and quantitative strands of study throughout each of the stages or phases of the research process. It is the central characteristic of MMR that promotes reflection of how the quantitative and qualitative methods are intertwined (Creamer, 2018; Plano-Clark and Ivankova, 2016; Tashakkori, Johnson, and Teddlie, 2021). However, researchers commonly spend minimum, or no, effort on integration and do not acknowledge its value when conducting MMR (Feters, Curry, and Creswell, 2013).

Integration can occur at different points, for example, at the design level, the methods level or the interpretation and reporting level (Feters, Curry, and Creswell, 2013) depending on the study design. One area of critique is the extent to which MMR researchers genuinely integrate their findings at the interpretation and reporting level, that is, whether the final discussion and conclusions of a MMR study represent an interweaving of

the individual quantitative and qualitative components rather than merely a summary of each (Bryman, 2007). However, in recent years, some sophisticated procedures have been developed to support integration in MMR (Guetterman, Creswell, and Fetters, 2015; Johnson, Grove, and Clarke, 2019). This article provides an example of integration using an integration tool, known as joint display or matrix (Fetters, Curry, and Creswell, 2013). Fetters (2019) defined a joint display as:

A table or a figure that can be used for organizing mixed data collection and analysis. It represents juxtaposed data collection or findings of qualitative and quantitative strands of a project. It includes or implies specific linkages or areas of commonalities across the qualitative and quantitative strands that can be expressed as constructs or domains and it also contains an interpretation, often called meta-inferences, about the meaning of the two types of results when considered together.

A joint display provides a visual representation of how the qualitative and quantitative findings in a MMR study can be integrated. A very useful example of a joint display is provided from Legocki et al. (2015) that assessed the perspectives of key stakeholders on adaptive clinical trials for acute brain injury emergencies. The authors conducted a convergent MMR design using a survey component and mini-focus groups. Four different joint displays were used as a tool to support the integration of the findings (i.e. participants' quotes and a box plot) which in turn highlighted the different perspectives of the participants on the ethical advantages and disadvantages of adaptive clinical trials. Bustamante (2017) designed a theory-driven convergent MMR case study to create an online professional development program for teachers of Spanish. The innovative circular joint display allowed the researcher to show how theory was linked to results from both components of her study.

A recent editorial summarized a number of MMR studies from different disciplines and provided an overview of the approaches used to achieve integration (Guetterman, Molina-Azorin, and Fetters, 2020). For example, Johnson, Grove, and Clarke (2019) developed a pillar integration process (PIP) to achieve a systematic and replicable technique for integrating MMR findings. The PIP included four stages: 1) listing; 2) matching; 3) checking; and 4) pillar building that were utilized sequentially after the quantitative and qualitative data analysis had been separately completed. Integration of findings and innovative use of joint displays have been emphasized in MMR studies, however, there remains a general lack of understanding of the concept of integration in physiotherapy and other allied health professions.

One explanation could be that articles discussing the philosophical and methodological issues associated with MMR are published in journals that are not commonly read by allied health-care practitioners or researchers. Another explanation would be that researchers choose MMR merely as a practical or 'what works' approach that, in their view, does not require them to address the methodological and unique design characteristics of this approach (Meixner and Hathcoat, 2019). Researchers frequently report and interpret the findings of the MMR components separately within an article or submit their study as separate articles in order to adhere to journal word limit or space policies or to potentially maximize their publications. When findings are not integrated or they are superficially integrated without following a structured approach, the final interpretations may reflect only one dataset and the purpose and rigor of MMR can be called into question. Similarly findings from two methods may confirm but may also contradict each other. Such contradictions need to be acknowledged by the researcher when reporting the study in order to enable the reader to critically appraise the study design and findings.

For example, Andrew et al. (2019) explored physiotherapists' views about providing services to people with severe and persistent mental illness. The authors did not specify the type of design (e.g. exploratory, explanatory, or convergence). They presented their results separately (contiguously) but without explanation or the use of a diagram to demonstrate how integration was achieved. The authors did describe their interpretive analytic process for each component, but integration was only evident in the discussion section. It would have been better if the process for integration had been clearly described and evidenced in a joint display as either a table or figure. As Bazeley (2009) suggested in order to address common complex research questions and hypotheses, quantitative, and qualitative data need to be interdependent. Such interdependence can be represented by developing joint displays and researchers in health care may find these helpful in achieving integration.

The purpose of this theoretical article is to provide step-by-step guidance to integration at the interpretation of findings and reporting level using a physiotherapy study example. The overall aim of the research was to explore older employees' experiences of chronic musculoskeletal disorders in relation to their employment, their perspectives on managing these conditions in the workplace, the strategies used to facilitate and maintain their roles and responsibilities, and identify what services were offered to them. A MMR design was implemented to address the overarching aim and its

objectives. In the first qualitative phase of this MMR study 16 semi-structured interviews gathered in-depth information from older (over the age of 50) employees. In the second survey research phase, an online questionnaire was sent to identify the characteristics and other variables of employees over the age of 50 with a CMSD and create associations between these variables. Further information about the project can be found in the published article (Skamagki, Carpenter, King, and Wählén, 2022).

An example of integration at the 'interpretation and reporting' level

Integration in a MMR study can occur at several different levels depending on the design and scope of the study (Guetterman, Molina-Azorin, and Fethers, 2020; Johnson, Grove, and Clarke, 2019). However, this article focuses on the integration at the interpretive and reporting level only. This level has been described as integrating through a narrative, data transformation, or joint displays (Fethers, Curry, and Creswell, 2013). Fethers, Curry, and Creswell (2013) explained that in the narrative approach the qualitative and quantitative findings are reported separately, whereas in the transformative approach one dataset is converted into the other type of data and then integrated. Lastly, the joint display approach uses visual means to discover new insights. This article presents the integration approach using both a narrative and a joint display (Skamagki, Carpenter, King, and Wählén, 2022). In a published manuscript, the integration of the findings is described at the 'results' section and the interpretation is reported at the 'discussion' section. This process was guided by the work of Fethers (2019) and Guetterman, Molina-Azorin, and Fethers (2020) and is thoroughly explained in the subsequent section.

Step 1: creating a joint display

A joint display is a table or a figure that is used to organize the findings of all phases of a MMR study in a clear and logical manner. It helps the researcher to identify the links between the qualitative and quantitative phases and allow for associations or comparisons to emerge. Different options for creating a joint display are available (Guetterman, Creswell, and Fethers, 2015) depending on the choice of study design and the timing (e.g. they can be created before or after the data collection process). This study discusses the narrative joint display that was created at the end of the data collection process of the survey phase to synthesize the qualitative and survey research components.

Researchers who conduct a sequential design may choose to start with either the qualitative or quantitative

data as a point of comparison in a joint display. In the example provided in Table 1, the qualitative themes were displayed in the first column of the joint display and used as the overarching concepts for both phases. The contributing categories (i.e. subthemes) of the qualitative phase were then displayed in the second column and linked to the overarching themes. In the third column of the joint display, the survey research findings (i.e. questionnaire responses with percentages) were mapped against the overarching themes and the categories. Lastly, the fifth column included participants' quotes that were also linked to the overarching qualitative themes and categories.

Table 1. An example of creating a narrative joint display. Here, the qualitative themes from the first phase of the exploratory design are overarching the findings of both MMR phases.

Overarching themes	Categories	Quantitative findings	Qualitative findings
Impact on wellness	Work performance	53% (N = 57/107) declared poor work ability	I mean I ruined my hands working with no support for about 20 years. That is why I am worse now. (Josh)
		60% (N = 64/107) reported that the CMSD interfered 'quite a lot/ extremely' with their ability to effectively work during the past six months	I don't know how much it really affects me now. I guess it affected me when I was having to go and have some physio a few times. [before Christmas around 6 months ago] (Kathryn)
		80% (N = 86/107) reported that is 'very' to 'extremely important' to perform well in their job	I like working, and as long as I am well enough to do it and do it well- so you can still have some pride in what you are doing- I want to keep working. (Laura)
			Well, when you have arthritis in your hands you tend to lose the strength. Because most of the time it was quite physical work, I found it (pause) like, I work with a range of tools so like spanners and screwdrivers and occasionally I'd find that I can't grip. (John)

Table 2. An example of the mixed methods data linking activity.

Overarching themes	Categories	Quantitative findings	Linking Activity	Qualitative findings
Employees 'approach towards the condition	Work ethic	73% (N=78/107) of respondents indicated that they work with ongoing pain or discomfort		I think the trouble is, when you have a condition like the one I've had all my adult life, you tend to get quite resilient. So if I had a pain in my knee I would still come into work. (Claire)
		74% (N=79/107) reported that they would remain at work even on the days they felt unwell		And so what they [colleagues] hear is, "she doesn't want to do that workshop". What they don't hear is, "I don't want to do that workshop because it's, you know, I feel that the lifting and stress of it all is just too difficult" (Annette)
		20% (N=21/107) reported that they would ask their colleagues to help them with a task if they were unable to perform well.		And I think you get like that because you have to be like that. Because if I had taken a day off every time I had pain I'd hardly have worked the last 35 years (Anne) Yes, I would work with pain. Because it's been a feature of my life that I've just got used to having, you know. (Sally) I don't mind working hard; I do not mind doing this alone and I do not mind working long hours regardless how I am (Josh) But if there is like a colleague in the company, you know, in the office and I will either ask them to support or ask if they can do it for me (Sarah)

This linking activity involved large data sets and this example represents a snapshot of the whole process. The colored arrows link the survey and qualitative findings that are in agreement and the dotted lines show areas of disagreement between the findings. The activity aims to organize the qualitative and the quantitative sources so linkages can be found.

Step 2: linking activity

The next step is to establish linkages between the quantitative findings (i.e. descriptive statistics) and qualitative findings (i.e. illustrative quotes/memos/coding/categories) using a mapping exercise. In this exercise, each contributing category was searched for related quantitative findings and one or more appropriate qualitative participant quotes were chosen to illustrate these. This was a time-consuming process involving moving backwards and forwards between the qualitative and quantitative data to reveal areas of similarity and contrast. Comparing and contrasting the different component findings is a core stage of the integration process (Fetters, 2019). In this activity, arrows of different colors linked the survey findings with relevant quotes. At the end of this process, a final quote was selected for each link in the joint display. An example of a linking activity can be found in Table 2.

Step 3: establishing relationships

After identifying and organizing the relevant data into columns 1–5, the integrative process continued by looking for inconsistencies, alignments, or conflicting findings in order to establish relationships between the qualitative and quantitative data. These links enhance interpretations and can be assigned in a new column in

the narrative table. Fetters (2019) suggested that using the labels 'convergence,' 'complementarity,' 'expansion,' and 'divergence' can be useful in structuring the researcher's interpretation of the 'fit' between the findings. 'Convergence' describes the agreement between the two sets of findings and 'complementarity' occurs when the findings illustrate different but non-contradictory interpretations. 'Expansion' occurs when some findings overlap but also provide space for further interpretation. Finally, 'divergence' occurs when the quantitative and the qualitative findings demonstrate conflicting interpretations. This labeling activity provides integrated understandings called meta-inferences (Fetters, 2019). Meta-inferences result in new insights to address the study aim and objectives. An example of the labeling activity is provided in Table 3.

The use of the 'convergence' and 'divergence' labels in Table 3 is straightforward. 'Convergence' describes the positive alignment between the survey respondents who had a plan for how to manage the chronic musculoskeletal disorders until their retirement and those interview participants who described the arrangements they had made in order to retire healthy. The 'divergence' label was used to address the lack of agreement between qualitative and quantitative findings and to provoke a critique of the forced response/closed questions used

Table 3. A snapshot of the larger theme ‘Thoughts and emotions on retirement and employment’ using meta-inferences and labels.

Overarching themes	Categories	Quantitative findings	Qualitative findings	Meta inferences and interpretation
Thoughts and emotions on retirement and employment	Government changes and healthy retirement	40% (N = 42/107) had a plan of how to manage their condition until retirement	So, I will be taking what they call “phased retirement” which is actually the ideal thing for me. I could go down to 2 days; I can go down one more day before I actually fully retire.	Areas of convergence and divergence between the two phases (60% did not have a plan). Some employees had carefully planned their retirement and/or were ready for an early exit whereas others where not financially able or had not planned what they will do if they cannot work due to their condition. Areas of expansion where qualitative sources help to expand the survey findings. Those who have planned for their retirement with e.g. private pensions, investments and health insurance felt confident regardless of the changes. Areas of complementarity as all of women in subgroup analysis indicated that governmental changes impacted their ability to enjoy retirement. This response was complemented by the qualitative sources as all the women felt they were more affected than men and they were unsure how these further changes by the government would affect their retirement.
		78% (N = 83/107) declared that governmental changes would impact on employees’ ability to enjoy retirement. All 63 women agreed.	It was 62 (retirement age) when I originally joined and then 62 they’ve just gotten pushed it to 65 and few years later to 67. And I’m thinking all the time how I will keep going for another 12 years.	
		62% (N = 66/107) of the respondents felt adequately informed about the pension age changes.	I’m hoping to make it till 60 and then I’ll review things. But I am still helping my daughter financially and I am also looking after my mum you see.	

in the questionnaire. For example, only 40% (N = 42/107) of the survey respondents agreed with the interview participants on having a plan to manage their condition until retirement. The ‘expansion’ label indicates

instances where the qualitative and quantitative data addressed the same phenomenon but in different and informative ways. For example, the qualitative findings explained how changes in the retirement age affected the



Figure 1. A visual illustration of the synthesized findings that contributed to the theme ‘Social support and disclosure’.

retirement plans of employees with a chronic musculoskeletal disorder. Finally, the label ‘complementarity’ was used when new insights or interpretations were illustrated by the integrated findings. For example, qualitative responses and categorical data from the survey study suggested that women were affected more by the retirement changes.

Step 4: interpreting and reporting

The final stage in the integration process is reporting the synthesized findings. Fetters, Curry, and Creswell (2013) suggested that in MMR a ‘contiguous’ approach involves the separate analysis and reporting of the qualitative and quantitative findings, whereas a ‘weaving’ approach involves reporting the findings together on a theme-by-theme basis. In our experience, authors decide which approach to take depending on their purpose for presenting their study findings, the type of article they intend to write, journal publication requirements, and the potential audience. Although not conclusive in an academic piece of work submitted as a course requirement or for a grade (i.e. a university essay, dissertation, or thesis) a contiguous approach may be desired because each phase can be separately presented and explained. On the other hand, a weaving approach may be preferable when writing for publication as findings of the two phases can be presented in one section enabling a detailed discussion in subsequent sections of the manuscript.

A visual illustration of the synthesized findings using geocoding was used in this study (Figure 1). This is not considered an essential stage of the integrative process, but an effectively presented visual display can help the reader to understand the synthesized findings (Fetters, 2019) and process the data more easily (Evergreen, 2019). The visual display in this study used the map of the West Midlands where the study was conducted. Graphics were used to represent the employment roles discussed in the qualitative phase and further explored in the survey phase and examples of illustrative qualitative quotes are presented in bubbles. For the purpose of maintaining anonymity, the locations of the participant icons are not accurate representations of their places of work. Similarly, the individual pictures do not represent the participants’ ages, gender, or behavior.

Conclusions

This paper provides a step-by-step approach to integration by using a narrative and a visual joint display both of which may be useful for postgraduate students and early-career researchers in physiotherapy or allied health subjects who choose to conduct a MMR study. A joint display enables the qualitative and the quantitative data to be blended

together and a synthesis of the findings to be achieved. In this way the conclusions drawn can extend beyond the findings of each study component and enable a more detailed exploration and understanding of the topic of interest.

The complexity of healthcare issues and the diversity of healthcare recipients have contributed to the increasing use of MMR designs in health care (Ivankova and Kawamura, 2010; Strudsholm et al., 2016). Conducting MMR requires an in-depth understanding of the methodology and the range of data collection methods that are available. Integration and interpretation of the findings are important elements to consider when designing a MMR study. As a result, researchers require a broader knowledge base and research skills than are needed to conduct quantitative or qualitative research alone. Designing and implementing MMR in teams where specific research expertise can be shared is recommended.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The author(s) reported there is no funding associated with the work featured in this article.

ORCID

Glykeria Skamagki  <http://orcid.org/0000-0001-9543-1679>

References

- Åkerblad L, Seppänen-Järvelä R, Haapakoski K 2020 Integrative strategies in mixed methods research. *Journal of Mixed Methods Research* 15: 152–170. doi:10.1177/1558689820957125.
- Andrew E, Briffa K, Waters F, Lee S, Fary R 2019 Physiotherapists views about providing physiotherapy services to people with severe and persistent mental illness: A mixed methods study. *Journal of Physiotherapy* 65: 222–229. doi:10.1016/j.jphys.2019.08.001.
- Bacon M 2012 *Pragmatism: An Introduction*. Cornwall: Polity Press.
- Bazeley P 2009 Analysing qualitative data: More than ‘identifying themes.’ *Malaysian Journal of Qualitative Research* 2: 6–22.
- Bryman A 2006 Paradigm Peace and the Implications for Quality. *International Journal of Social Research Methodology: Theory and Practice* 9: 111–126.
- Bryman A 2007 Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research* 1: 8–22. doi:10.1177/2345678906290531.
- Bustamante C 2017 TPACK and teachers of Spanish: development of a theory-based joint display in a mixed methods

- research case study. *Journal of Mixed Methods Research* 13: 163–178. doi:10.1177/1558689817712119.
- Creamer E 2018 An introduction to fully integrated mixed methods research. Thousand Oaks: SAGE.
- Creswell JW 2011 Controversies in mixed methods research. In: Denzin NK, Lincoln YS (Eds) *The SAGE handbook of qualitative research*, (4th), pp. 269–283. Thousand Oaks: SAGE.
- Creswell JW, Garrett A 2008 The “Movement” of mixed methods research and the role of educators. *South African Journal of Education* 28: 321–333. doi:10.15700/saje.v28n3a176.
- Creswell JW, Plano-Clark V 2011 *Designing and conducting mixed methods research*. (2nd), Thousand Oaks: SAGE.
- Creswell JW, Plano-Clark V 2017 *Designing and conducting mixed methods research*. (3rd), Thousand Oaks: SAGE.
- Evergreen SD 2019 *Effective data visualization: the right chart for the right data*. Thousand Oaks: SAGE.
- Fàbregues S, Escalante-Barrios EL, Molina-Azorin JF, Hong QN, Verd JM 2021 Taking a critical stance towards mixed methods research: A cross-disciplinary qualitative secondary analysis of researchers’ views. *PLoS One* 16: e0252014. doi:10.1371/journal.pone.0252014.
- Fetters MD 2019 *The mixed methods research workbook activities for designing, implementing, and Publishing Project* Thousand Oaks: SAGE.
- Fetters MD, Curry LA, Creswell JW 2013 Achieving integration in mixed methods designs -Principles and practices. *Health Services Research* 48: 2134–2156. doi:10.1111/1475-6773.12117.
- Fetters MD, Freshwater D 2015 The 1 + 1 = 3 integration challenge. *Journal of Mixed Methods Research* 9: 115–117. doi:10.1177/1558689815581222.
- Guetterman TC, Creswell JW, Fetters MD 2015 Integrating quantitative and qualitative results in health science mixed methods research through joint displays. *Annals of Family Medicine* 13: 554–561. doi:10.1370/afm.1865.
- Guetterman TC, Molina-Azorin JF, Fetters MD 2020 Virtual special issue on “integration in mixed methods research. *Journal of Mixed Methods Research* 14: 430–435. doi:10.1177/1558689820956401.
- Ivankova N, Kawamura Y 2010 Emerging trends in the utilization of integrated designs in the social, behavioral, and health sciences. In: Tashakkori A, Teddlie C (Eds) *Sage handbook of mixed methods in social and behavioral research*, (2nd), pp. 581–611. Thousand Oaks: SAGE.
- Johnson RE, Grove AL, Clarke A 2019 Pillar integration process: A joint display technique to integrate data in mixed methods research. *Journal of Mixed Methods Research* 13: 301–332. doi:10.1177/1558689817743108.
- Johnson BR, Onwuegbuzie AJ 2004 Mixed methods research: A research paradigm whose time has come. *Educational Researcher* 33: 14–26. doi:10.3102/0013189X033007014.
- Legocki LJ, Meurer WJ, Frederiksen S, Lewis RJ, Durkalski VL, Berry DA, Barsan WG, Fetters MD 2015 Clinical trialist perspectives on the ethics of adaptive clinical trials: A mixed-methods analysis. *BMC Medical Ethics* 16: 27. doi:10.1186/s12910-015-0022-z.
- Loft MI, Esbensen BA, Kirk K, Pedersen L, Martinsen B, Iversen H, Mathiesen LL, Poulsen I 2018 Nursing staffs self-perceived outcome from a rehabilitation 24/7 educational programme - A mixed-methods study in stroke care. *BMC Nursing* 17: 17. doi:10.1186/s12912-018-0285-z.
- McEvoy MP, Lewis LK, Luker J 2018 Changes in physiotherapy students’ knowledge and perceptions of ebp from first year to graduation: A mixed methods study. *BMC Medical Education* 18: 109. doi:10.1186/s12909-018-1212-4.
- Meixner C, Hathcoat JD 2019 The nature of mixed methods research. In: Liamputtong P (Ed) *Handbook of Research Methods in Health Social Sciences*, pp. 51–70. Singapore: Springer.
- Morgan DL 2014 Pragmatism as a paradigm for social research. *Qualitative Inquiry* 20: 1045–1053. doi:10.1177/1077800413513733.
- O’Cathain A, Murphy E, Nicholl J 2008 The quality of mixed methods studies in health services research. *Journal of Health Services Research & Policy* 13: 92–98. doi:10.1258/jhsrp.2007.007074.
- Pires D, Cruz EB, Costa D, Nunes C 2022 Beyond pain and disability: An explanatory mixed methods study exploring outcomes after physiotherapy intervention in patients with chronic low back pain. *Disability and Rehabilitation* 44: 881–890. doi:10.1080/09638288.2020.1781938.
- Plano-Clark V, Ivankova N 2016 *Mixed methods research: a guide to the field*. Thousand Oaks: SAGE.
- Pratte G, Hurtubise K, Rivard L, Berbari J, Camden C 2018 Developing a web platform to support a community of practice: A mixed methods study in pediatric physiotherapy. *Journal of Continuing Education in the Health Professions* 38: 19–24. doi:10.1097/CEH.000000000000185.
- Rauscher L, Greenfield BH 2009 Advancements in contemporary physical therapy research: Use of mixed methods designs. *Physical Therapy* 89: 91–100. doi:10.2522/ptj.20070236.
- Regnault A, Willgoss T, Barbic S 2018 Towards the use of mixed methods inquiry as best practice in health outcomes research. *Journal of Patient-Reported Outcomes* 2: 19. doi:10.1186/s41687-018-0043-8.
- Rodríguez-Nogueira Ó, Moreno-Poyato AR, Álvarez-Álvarez MJ Pinto-Carral A 2020 Significant socio-emotional learning and improvement of empathy in physiotherapy students through service learning methodology: A mixed methods research. *Nurse Education Today* 90: 104437. doi:10.1016/j.nedt.2020.104437.
- Shaw JA, Connelly DM, Zecevic AA 2010 Pragmatism in practice: Mixed methods research for physiotherapy. *Physiotherapy Theory and Practice* 26: 510–518. doi:10.3109/09593981003660222.
- Skamagki G, Carpenter C, King A, Wählin C 2022 Management of chronic musculoskeletal disorders in the workplace from the perspective of older employees: A mixed methods research study. *International Journal of Environmental Research and Public Health* 19: 9348. doi:10.3390/ijerph19159348.
- Smith B, Sparkes AC, Phoenix C, Kirkby J 2012 Qualitative research in physical therapy: A critical discussion on mixed-method research. *Physical Therapy Reviews* 17: 374–381. doi:10.1179/1743288X12Y.0000000030.
- Strudsholm T, Meadows LM, Robinson Vollman A, Thurston WB, Henderson R 2016 Using mixed methods to facilitate complex, multiphased health research. *International Journal of Qualitative Methods* 15: 1–11. doi:10.1177/1609406915624579.
- Tashakkori A, Johnson R, Teddlie C 2021 *Foundations of mixed methods research: integrating quantitative and qualitative approaches in the social and behavioral sciences*. (2nd), Thousand Oaks: SAGE.