ROUTLEDGE RESEARCH IN SPORT AND EXERCISE SCIENCE

# Mixed Methods Research in the Movement Sciences

## Case studies in sport, physical education and dance

Edited by
Oleguer Camerino, Marta Castañer and
M. Teresa Anguera

# Mixed Methods Research in the Movement Sciences

Mixed methods research techniques, combining both quantitative and qualitative elements, have become well established throughout the social, behavioural and natural sciences. This is the first book to focus on the application of mixed methods research in the movement sciences, specifically in sport, physical education and dance. Researchers and practitioners in each of these fields are concerned with the study of habitual behaviour in naturalistic contexts, and with the concurrent and sequential nature of events and states, precisely the kind of work that multimethod research designs can help illuminate.

The book is arranged into four sections. The first provides a thorough overview of mixed methods procedures and research designs, and summarizes their applicability to the movement sciences. The remaining sections then offer detailed case studies of mixed methods research in team and individual sports (analysing hidden patterns of play and optimizing technique), kinesics and dance (analysing motor skills behaviour in childhood, and the complexity of motor responses in dance), and physical education (detecting interaction patterns in group situations, and optimizing non-verbal communication by teachers and sports coaches).

*Mixed Methods Research in the Movement Sciences* offers an important new tool for researchers and helps to close the gap between the analysis of expert performance and our understanding of the general principles of movement science. It is important reading for any student, researcher or professional with an interest in motor control, sport and dance pedagogy, coaching, performance analysis or decision-making in sport.

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# Preface

The broad field of sport, physical education and dance has provided extensive material for research based on a wide range of methodological approaches. However, there is now a need to move toward research designs that offer an optimal integration of both quantitative and qualitative techniques. These designs, which have enormous potential, are commonly referred to as multi-methods or *mixed methods*.

In the context of this book the methodological integration of quantitative and qualitative approaches opens up new possibilities in relation to two aspects: (1) optimizing the dynamics and strategies of play and the decision-making process in sport; and (2) analysing the efficacy and quality of motor skills, technical abilities and specialized gestures in the specific areas of team and individual sports, dance and motor behaviour.

We believe that this text will serve as an ideal complement to other notable works and research on motor behaviour, sport, and methodological tools and designs.

## Structure and organization

Chapter 1, written by the editors M. Teresa Anguera, Oleguer Camerino and Marta Castañer, introduces the *mixed method* or *multi-method* approach to research, showing how it seeks an optimal integration of various analytic techniques by combining both quantitative and qualitative techniques. The chapter describes a range of mixed methods designs that are currently recognized by the scientific community and which may be used to study sport and physical activity. The other five chapters in the book are then structured around fourteen case studies that provide a practical illustration of how these designs can be applied to sport, motor behaviour, dance and gestural communication.

## Six case studies of team and individual sports

Chapter 2 comprises three case studies about team sports. In Case Study 2.1, Gudberg K. Jonsson presents both physiological and observational data regarding attacking play in rugby, and illustrates how to analyse temporal patterns

(T-patterns) in the latter. This way of detecting T-patterns in observational data serves as a reference for the other case studies in the book that also analyse these patterns. In Case Study 2.2 Oleguer Camerino and Xavier Chaverri focus on how the use of space influences the dynamics of play in basketball. The findings provide a basis for further research into interaction contexts and laterality in professional basketball. Finally, in Case Study 2.3, António Lopes and Oleguer Camerino use specific observational data concerning defensive tactics to analyse the dynamics of play and defensive systems used by elite handball teams.

Chapter 3 presents three case studies of individual sports. In Case Study 3.1, Xavier Iglesias and M. Teresa Anguera analyse the influence of environmental factors in the context of elite fencing. Case Study 3.2, written by Iván Prieto, Alfonso Gutiérrez and Oleguer Camerino, illustrates how to detect temporal relationships between the technical errors made in judo, and considers their consequences for the learning process. In Case Study 3.3, Jorge Campaniço focuses on specific technical behaviours and physiological parameters used in freestyle swimming.

## Five case studies concerning motor skills, laterality and dance

Chapter 4 comprises two case studies that aim to extend our knowledge regarding the specificity and diversity of motor skills and of laterality in motor responses. In Case Study 4.1 Marta Castañer and Juan Andueza compare the spontaneous motor responses produced during two forms of motor behaviour associated with natural and urban contexts, namely children's outdoor play and parkour, respectively. In Case Study 4.2 the same authors, together with Pedro Sánchez-Algarra and M. Teresa Anguera, develop specific and exhaustive instruments for analysing the laterality of motor behaviour.

Chapter 5 focuses on dance and choreography. In Case Study 5.1 Marta Castañer shows how to observe and analyse dance performances, taking as her example works by arguably two of the most important choreographers of the twentieth century: Pina Bausch and Maurice Béjar. In Case Study 5.2 Carlota Torrents and Marta Castañer adapt the observation instrument used in the previous case study in order to analyse contact dance improvisation, an interesting speciality within contemporary dance. Finally, in Case Study 5.3, Marta Castañer, Carlota Torrents, Gaspar Morey and Toni Jofre describe how a motion capture system can be used to identify the kinematic aspects of contemporary dance skills, before comparing and contrasting these data with the aesthetic appraisals of these skills given by observers.

## Three case studies regarding the optimization of communication in relation to coaches, teachers and instructors

Chapter 6 focuses on the study of communication in relation to teachers and professionals in the field of motor behaviour, specifically, physical education teachers, coaches and fitness instructors.

In Case Study 6.1 Marta Castañer shows how to analyse the non-verbal communication of physical education teachers, the aim being to identify their verbal and nonverbal communicative skills. In Case Study 6.2 the same author, together with Catarina Miguel, adapts part of the observation system used in the previous case study to detect the styles of communication used by futsal coaches in competitive contexts. Finally, in Case Study 6.3, Susana Franco, Jose Rodriguez and Marta Castañer study the behaviour of fitness instructors and the preferences and satisfaction levels of users with respect to this behaviour.

## Target audience

In a changing world with such a wide range of technological means for obtaining and analysing data it is increasingly necessary to develop powerful and versatile designs that are able to combine qualitative and quantitative data, rather than regarding them as distinct entities. The characteristics of these new designs take them beyond traditional methodological approaches, which were defined as either quantitative or qualitative, and pave the way for a more integrated and broader perspective on research. In the context of sport, physical education and dance an increasing number of professionals are now turning to mixed methods designs as the way forward. As such, the present book should be useful not only to researchers on the subjects addressed herein, but also to coaches, choreographers and educational specialists. It will also be of interest to a range of postgraduate students, especially those in the fields of physical education, sport and dance, and regardless of the country in which they work.

# Part I

# The mixed methods approach to research

# 1 Mixed methods procedures and designs for research on sport, physical education and dance

*M. Teresa Anguera, Oleguer Camerino and Marta Castañer*



## INTRODUCTION

### Integrating the qualitative and the quantitative through mixed methods

Research in the field of physical activity and sport science has traditionally been based on the quantitative procedures that have been developed in other areas of knowledge, such as the biomedical sciences, psychology and, more recently, sociology. Over the past decade, however, this tendency in favour of the quantitative approach to the study of physical activity has gradually given way to a more balanced view (Heinemann 2003), one in which neither quantitative nor qualitative methods are regarded as inherently better. Rather, each of these methodological perspectives is considered to offer a different way of understanding and approaching the study of physical activity and sport. Furthermore, this is seen as applying to each stage of the research process, since both approaches:

- Guide the study objectives.
- Use various techniques for gathering data: for example, observation (recording a soccer match), a field log (notes on a basketball training session), an in-depth interview (how an athlete felt after losing), a structured questionnaire (about the quality of municipal sports services), a standardized test (of anthropometry or biomechanics), temporal measures (duration of maximum effort during a 400 m run), or psycho-physiological assessment (battery of fitness tests).
- Select the sample through specific techniques.
- Use a variety of procedures to present the results.

In this book we aim to show that quantitative and qualitative methods can be integrated and complement one another through what is generally known as the *mixed methods* approach, sometimes referred to as *synthetic interpretative methodology* (Vann and Cole 2004) or *qualiquantology* (Stenner and Rogers 2004). Whatever the term used, the process involves the collection, analysis and combination of quantitative and qualitative data in the same study. Some authors have likened the emergence of this approach to a 'silent revolution' (Denzin and Lincoln 1994; Johnson *et al*. 2007; O'Cathain 2009). At all events, the notion of mixed methods refers not merely to the gathering of different kinds of data about the same behaviour or episode, but also implies combining the inductive approach to concept generation (Bergman 2010) with deductive logic. Furthermore, the mixing applies to the whole research process, i.e. problem definition, data collection, data analysis, interpretation of results, and the final report (Wolcott 2009).

We believe that such an approach can offer a more holistic understanding of human motor behaviour and is well suited to dealing with its complexity. Although it has only recently begun to be applied in research on physical activity and sport, the broad potential of mixed methods is illustrated by the increasing number of related publications in this field (Hernández-Mendo and Anguera 2002; Jonsson *et al*. 2006; Castañer *et al*. 2009; Fernández *et al*. 2009; Jonsson *et al*. 2010; Torrents *et al*. 2010).

## TYPES OF MIXED METHODS DESIGNS

The research design serves to guide the methodological steps that are taken throughout the process of gathering, managing and analysing information in any study (Anguera *et al*. 2001). In the context of mixed methods, which are based on the complementarity and integration of the quantitative (QUAN) and the qualitative (QUAL), a number of different designs have been developed in recent years (Teddlie and Tashakkori 2003, 2006; Grinnell and Unrau 2005; Mertens 2005; Creswell and Plano Clark 2007; Tashakkori and Creswell 2007, 2008) and our aim here is to show how these can be adapted to the requirements of research on physical activity and sport.

### Different combinations of mixed methods designs

In broad terms the different combinations can be summarized as follows:

**Multi-method procedure**: more than one method but from the same perspective, i.e. the combinations QUAN/QUAN or QUAL/QUAL. In multi-method studies the research problem is tackled by using two data collection techniques (for example, participant observation or oral histories) or two methods of investigation (for example, ethnography or case studies), each one of which belongs to the same modality (QUAN or QUAL).

Example 1

We would use a quantitative multi-method (QUAN/QUAN) at the start of a season when we want to assess the performance of a handball team by using a battery of fitness tests that determine parameters such as the players' peak oxygen uptake or resistance.

Example 2

We would use a qualitative multi-method (QUAL/QUAL) in a study of the quality of municipal sports services, beginning with a discussion group involving the monitors of these services and following this up with in-depth interviews of a sample of service users regarding their level of satisfaction.

This methodological combination and complementarity runs throughout the research process: problem formulation, theoretical development, sampling, data collection and analysis, and report writing.

**Mixed methods procedure**: more than one method and from different perspectives, i.e. the combination of QUAL and QUAN. In mixed methods research the combination of techniques must offer a better way of achieving the objectives. There are two different approaches here:

- Mixed method design (occurs in one stage or section of a study). Mixed method designs use qualitative and quantitative data and analytic techniques in a parallel or sequential way. An important advantage of this is that researchers can then address confirmatory and exploratory questions simultaneously, and, consequently, both verify and generate theory in the same study.
- Mixed model design (may occur in several stages or sections of a study). Mixed model designs imply the combination of techniques in several or all the stages of a study (Tashakkori and Teddlie 2003): problem description, the choice of methodology, the kind of data collection, the analytic techniques used, and the inference derived from the results.

Example 3

Exploration in a stratified and random sample of the use of physical activities by young people during their leisure time, this being based on a group discussion (QUAL) about the level of satisfaction with the activities performed and a questionnaire (QUAN) about their involvement in sport during weekends and holidays.

The process of mixed methods can also be considered in terms of five key characteristics (Greene and Caracelli 2003):

- *Triangulation*, or the search for convergence in the results.
- *Complementarity*, or overlap in the different facets of a phenomenon.
- *Initiation*, or the discovery of paradoxes or contradictions.
- *Development*, or the sequential use of methods, such that the results of the first method inform the use of the second one.
- *Expansion*, or the study's depth and scope, which is revealed as it unfolds.

Example 4

These characteristics can be seen in a study whose aim is to identify gender differences in the use of physical activities, and which does so by means of: (a) observations (QUAL) of the behaviour of men and women in different sport-related settings; (b) administering questionnaires (QUAN) to men and women about their chosen activities; and (c) in-depth interviews with specific subjects (QUAL) about their level of satisfaction.

- *Triangulation*: of results from three instruments (QUAL/QUAN/QUAL).
- *Complementarity*: comparing observations with interview data (QUAL/QUAN).
- *Initiation*: contrast between the questionnaire and the interview (QUAN/QUAL).
- *Development*: interview on the basis of the observational data (QUAL/QUAL).
- *Expansion*: offer new activities on the basis of the results.

The different possibilities described above can be formulated in terms of types of design (Tashakkori and Teddlie 1998, 2003), which in this book will be illustrated in the context of research on sport, physical education and dance. The four main types are:

- Triangulation designs
- Dominant embedded designs
- Exploratory sequential designs
- Explanatory sequential designs.

## Triangulation designs

The mixed methods approach looks for compatibility between points of view. The term *triangulation* has its origins in the field of navigation, in which the known

position of two points and their angles was used to determine the unknown distance away of a third point (Smith 1975). Triangulation designs, which were first used in the pioneering work of Campbell and Fiske (1959), and subsequently developed by Denzin (1978) and other authors (Patton 1990), are well-suited to the complexities of research on physical activity and sport. Four kinds of triangulation are relevant here: triangulation of data, of investigators, of theory, and methodological triangulation.

### *Types of triangulation designs*

#### *Triangulation of data*

Here we start from different sources of data in the same study and distinguish between the methods used to obtain them. A sub-type would be when there are data that converge in the same study but which were gathered on different days or by different people. All this needs to be harmonized so as to avoid working with contradictory data.

> Example 5
>
> In tests of a team's fitness the temporal parameters of the data collection must coincide, since the results obtained for players' strength (QUAN), resistance (QUAN) and speed (QUAN) on different days or by different researchers may be contradictory.

#### *Triangulation of investigators*

In order to minimize bias due to human factors, different investigators participate in the same study so that any such influences on the study results can be systematically examined. Obviously, the mere fact that researchers carry out or are assigned different activities within a project does not constitute triangulation of investigators.

> Example 6
>
> Studying the functioning of after-school sport clubs by using observers with expertise in analysing sports organizations, the monitors of the different activities and the children's parents.

#### *Triangulation of theory*

The results of a study are interpreted from multiple perspectives, thereby increasing the likelihood of knowledge generation. This means 'approaching data with

multiple perspectives and hypotheses in mind [and that] various theoretical points of view could be placed side by side to assess their utility and power' (Denzin 1989: 241).

> Example 7
>
> Studying the physical activities practised by women, differentiating them by age, country or geographical area and from different sociological, psychological and ethnographic perspectives and paradigms.

***Methodological triangulation***

Different methods are used for the same research problem, with a distinction being made between within-method and between-methods triangulation. In the former, data are gathered using multiple techniques within a single methodology (QUAL or QUAN), which implies checking the internal consistency or reliability of the results obtained with each technique.

> Example 8
>
> Studying the effectiveness of a coach's communication in competitive settings through systematic observations (using video recordings) of his/her verbal communication during matches (QUAN) and survey interviews conducted with the players (QUAL).

By contrast, between-methods triangulation checks the consistency of results by comparing the findings obtained with various methodologies (QUAL or QUAN) and aims to determine their external validity (Jick 1979).

Triangulation is the most well-known and widely used among mixed methods designs (Creswell *et al*. 2003; Creswell and Plano Clark 2007) and aims to obtain different, yet complementary, data about the same episode (Morse 1991; Riba 2007) so as to better understand the research problem. More specifically, it seeks to complement the strengths and weakness of quantitative methodology (large sample size, trends, generalization, etc.) with those of the qualitative approach (small samples, interest in details, greater depth, etc.).

It is mainly applied when the investigator wishes to directly compare and contrast quantitative statistical results with qualitative information (QUAN/QUAL), for example, assessing the effectiveness of an exercise programme for obese children in which both their calorie intake and level of satisfaction are measured (see Example 9).

Example 9

Studying the repercussions of physical activity among obese children taking part in an intensive programme designed to change their eating habits and engage them in exercise under the supervision of specialists. On the one hand we would measure calorie intake by weighing them daily and monitoring the number of calories consumed at each meal (QUAN), but then combine this with interviews (QUAL) to assess their degree of motivation and adherence to the exercise programme.

Triangulation may also be used to validate quantitative results with qualitative data (QUAN+QUAL), for example, verifying that weight loss improves with greater adherence to an exercise programme.

The most common form of triangulation is the concurrent design, in which the investigator applies quantitative and qualitative methods (QUAN+QUAL) simultaneously, giving them equal weight and importance (see Figure 1.1).

Despite this concurrence, however, the two types of data are usually gathered separately and then combined by the investigator, before interpreting them as a whole. The data may also be transformed so as to facilitate the integration of both types during the analysis.

### *Variants of the triangulation design*

There are four variants of the triangulation design: the *convergence* model, the *data transformation* model, the *validating quantitative data* model, and the *multilevel* model. The first two differ in terms of how the investigator combines the two types of data (either during data management/analysis or during interpretation), the third is used to enhance the results obtained through questionnaires, and the fourth is used when working with different levels of analysis.

The convergence model can be regarded as the traditional approach to triangulation (Creswell 1999) and involves the separate collection and analysis of quantitative and qualitative data about the same phenomenon. These data are then converged (comparing and contrasting them) during the interpretation (see Figure 1.2). The purpose of convergent designs is to enable researchers to compare results

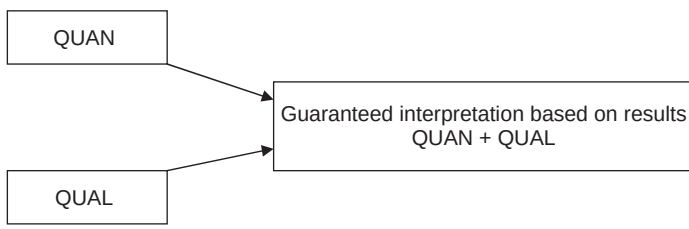


*Figure 1.1* Triangulation design (adapted from Creswell and Plano Clark 2007: 63).

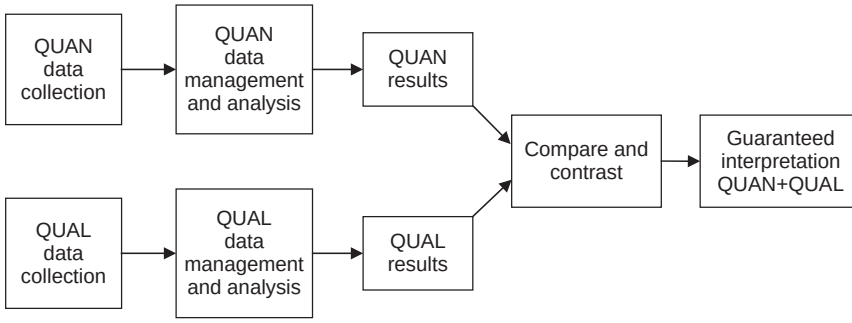


*Figure 1.2* Convergent design (adapted from Creswell and Plano Clark 2007: 63).

or to validate, confirm or corroborate quantitative results (QUAN) by means of qualitative data (QUAL).

> Example 10
>
> Determining the relationship between the degree of cohesion among a team's members and the effectiveness of their strategies during team play by creating a sociogram (QUAN) at the start of the season in order to determine the levels of acceptance or rejection among the players, these findings being compared with data from in-depth interviews (QUAL) conducted with team leaders about the team's dynamics, as well as with the results of systematic observations (QUAN) of the team's offensive play.

The data transformation design (Creswell *et al*. 2004) also involves the separate collection and analysis of qualitative and quantitative data. After the initial analysis, however, the researcher then transforms one type of data into the other, i.e. qualifying the quantitative results or quantifying the qualitative findings (Tashakkori and Teddlie 2003) (see Figure 1.3). This transformation enables the data to

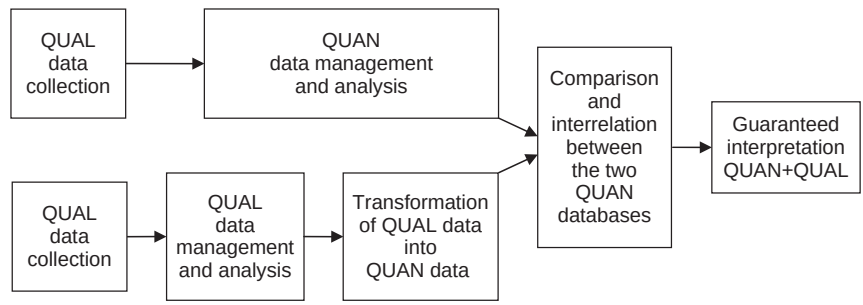


*Figure 1.3* Data transformation design (adapted from Creswell and Plano Clark 2007: 63).

be combined (Fielding and Fielding 1986), thereby facilitating the comparison, interrelationship and subsequent analysis of both sets of data.

Example 11

In relation to Example 10, this would imply using the sociometric measures (QUAN) of acceptance or rejection in order to understand group cohesion. At the same time, qualitative data would be gathered by means of interviews (QUAL), transforming these data into observational categories (QUAN) referring to strategic play in real competitive situations. The two sources of data would then serve to compare and inter-relate the results and enable a combined interpretation (QUAN+QUAL) about team cohesion.

The validating quantitative data design enables researchers to validate and expand the quantitative results obtained from a questionnaire (QUAN) by including a number of open-ended questions that provide qualitative information (QUAL). The researcher therefore collects both kinds of data with a single instrument. However, because the qualitative items are an addition to the quantitative measure they do not strictly constitute a qualitative database. As regards how this design might be used, one possibility would be to include open-ended questions (qual) in a questionnaire about the level of satisfaction with a given physical activity (QUAN) in order to validate the quantitative data and thus offer a (QUAL+qual) interpretation (see Figure 1.4).

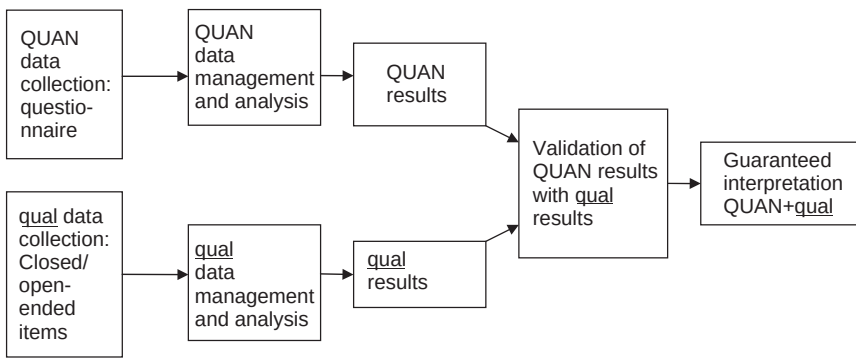


*Figure 1.4* Validation of quantitative data design (adapted from Creswell and Plano Clark 2007: 63).

Note: Given the secondary nature of the qualitative data we have respected the notation in which they are underlined rather than written in capitals.

Example 12

A study of the quality and subsequent improvement of the activities offered by a large public sports centre. A survey was administered to users, based mainly on numerical ratings (QUAN) of the quality of the monitors, facilities and services, but information was also gathered (qual) about activities that users would like to see offered in the future.

In the final variant, known as multilevel triangulation designs, researchers may collect quantitative data on one occasion and qualitative data on another, either concurrently or sequentially. This is followed by the analysis of these data and the subsequent obtaining of results. The results from each of the levels are then considered together so as to enable a combined interpretation (Tashakkori and Teddlie 2003; Bryk and Raudenbush 1992) (see Figure 1.5).

Example 13

A multilevel study of effectiveness in learning a new sporting technique that considers the conditions of the setting, the task complexity, and organic, psychological and perceptual factors among players. On the first level we would make systematic observations (QUAN) of training sessions, while the second level would involve gathering the opinions of players (QUAL) using a field log in which they recorded their impressions, within which (level 3) we would embed the results of a satisfaction survey (QUAN) that asked them about the utility of and their adaptation to the new training procedures.

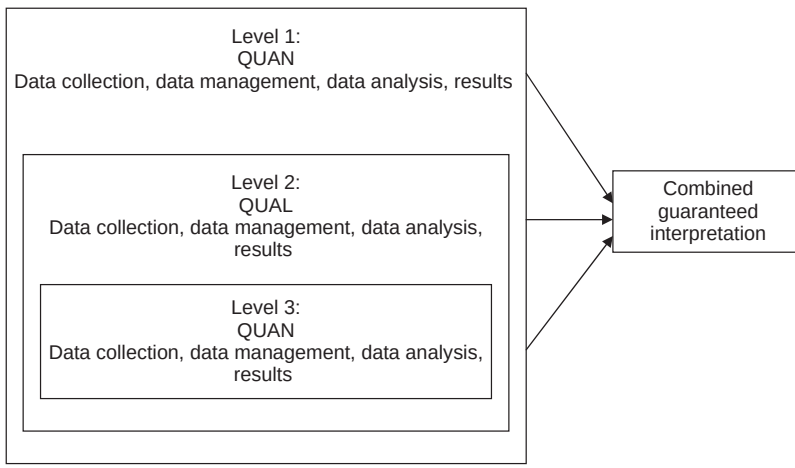


*Figure 1.5* Multilevel triangulation design (adapted from Creswell and Plano Clark 2007: 64).

***Advantages and challenges in using the triangulation design***

Triangulation designs have a number of strengths or advantages:

- They make sense intuitively and this makes them attractive to researchers.
- They are efficient, since data of different types can be collected simultaneously.
- Each type of data can be obtained independently.

The challenges they pose are as follows:

- Researchers need a certain level of expertise in order to make the results obtained from qualitative data compatible with the quantitative results, identifying convergence between them.
- There may be discrepancies between different samples, with different initial objectives, different sizes and different selection criteria, etc.
- Integrating qualitative and quantitative data can be difficult.
- There is a need to develop procedures that enable the transformation of qualitative and quantitative data, whether quantifying qualitative findings or qualifying quantitative results.

## Dominant embedded designs

In the dominant embedded design the researcher works with one dominant type of data (QUAN or QUAL) and then obtains data of another kind (quan or qual) as a secondary support. These secondary data therefore complement the primary or dominant data set (see Figure 1.6)

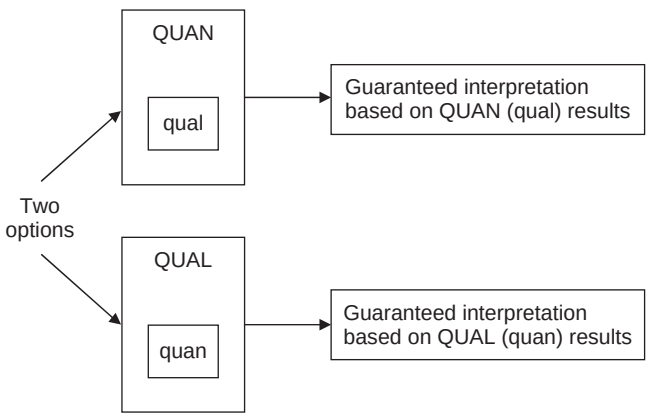


*Figure 1.6* Dominant embedded design (adapted from Creswell and Plano Clark 2007: 68).

Example 14

In the chapter related to analysing motor skills and laterality we describe a study in which laterality was first explored using a recording instrument that provided quantitative data (QUAN). These data were then contrasted with qualitative data (Qual) obtained through interviews with experts in physical education. These opinions served to develop a more dynamic version of the original instrument, which was then used to obtain a new set of quantitative (QUAN) data.

One of the most important challenges when using this design concerns complementarity, since the dominant data alone are not enough to solve the research problem. However, these designs are useful for complex experimental studies, particularly those of a longitudinal or continuous nature, such as research on fitness levels in large samples of the population.

***Variants of the dominant embedded design***

There are two variants of the dominant embedded design: the *correlational model* and the *experimental model*. In the embedded correlational model, qualitative data are embedded within a quantitative design. The researchers work with quantitative data (QUAN) but also collect secondary qualitative data (qual) that are correlated with the former as a complement throughout the research process, thereby enabling an interpretation based on (QUAN qual) results (Figure 1.7).

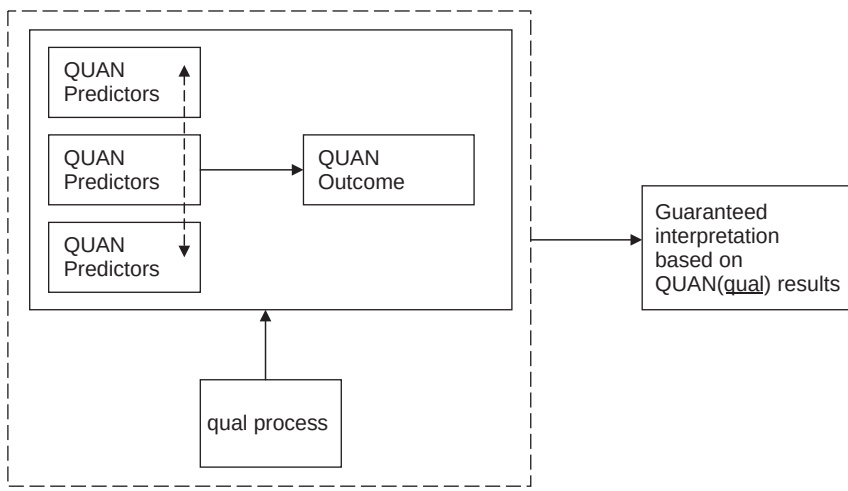


*Figure 1.7* Embedded correlational design (adapted from Creswell and Plano Clark 2007: 68).

Example 15

In a study of communicative interaction in a group of elderly people attending an aqua aerobics class, observational data (QUAN) were obtained by videoing the pool-based sessions in order to identify how the participants interacted with the monitor, the material and each other, thus providing an overall view of their performance. This was then contrasted with the participants' own views regarding the communicative experience, these being obtained by means of in-depth interviews (qual) with some of the elderly people (Camerino 1995).

In the embedded experimental model, qualitative data are embedded within a dominant experimental study. The qualitative data may be introduced prior to the intervention, during its implementation, or subsequent to its completion (see Figure 1.8).

Example 16

In a longitudinal study of changes in self-esteem among people involved in an intensive fitness programme aimed at controlling body weight, the following steps were taken: prior to the intervention the daily habits of participants were identified through qualitative monitoring in the form of personal diaries (QUAL); during the programme their weight was measured daily (QUAN); and after the programme in-depth interviews were conducted to gather their opinions about the effectiveness of the intervention (cual). The study was completed with an interpretation based on the results obtained from the whole process (QUAN cual).

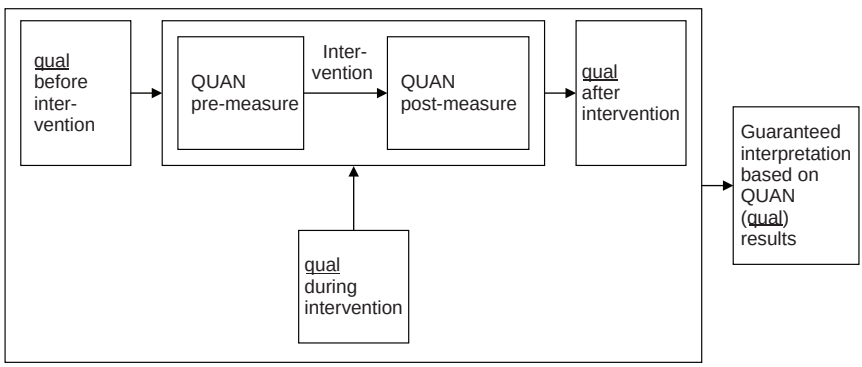


*Figure 1.8* Embedded experimental design (adapted from Creswell and Plano Clark 2007: 68).

This strategy is useful in studies about the consequences of physical activity, since the researcher needs qualitative information prior to the intervention in order to tailor it accordingly, to develop appropriate measurement instruments and to select participants. After the intervention, qualitative information is useful in terms of complementing or comparing the results obtained.

#### *Advantages and challenges in using the dominant embedded design*

The principal advantages of dominant embedded designs are:

- They are relatively easy to apply since one of the data sets takes precedence and the complementary method require less data.
- It is easier to obtain the data since one of the two types is given less priority.
- The dominant data are quantitative, regardless of whether the study is correlational or experimental, and this is likely to make these designs more readily acceptable.

The challenges faced when using dominant embedded designs are:

- The researcher must specify the purpose of collecting each type of data, whether dominant or subservient.
- It can be difficult to integrate the results when the two methods are used in order to tackle different research problems.
- The researcher has to decide when to collect the qualitative data (before, during or after the intervention), this decision depending on their purpose (shaping the intervention, explaining the process followed by users, following up outcomes, etc.).
- The researcher must decide which qualitative results will be used in the quantitative phase. The latter cannot be planned prior to the collection of the qualitative data as this could introduce treatment bias that affects the final results obtained.

### Exploratory sequential designs

In the exploratory sequential design an initial set of qualitative data is used to develop or guide a subsequent quantitative phase (Greene *et al*. 1989). The basic premise here is that prior exploration is necessary because no instruments or measures are available, because the variables are unknown, or because there is no existing theoretical framework. Thus, this design begins by collecting qualitative data to explore the phenomenon and then builds towards a quantitative phase (see Figure 1.9), the results of which are then linked to the initial qualitative findings.

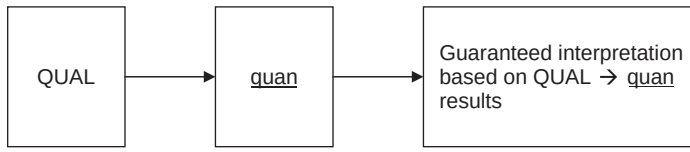


*Figure 1.9* Exploratory sequential design (adapted from Creswell and Plano Clark 2007: 76).

Example 17

A study of non-verbal behaviour in physical education classes according to the teacher's level of training. After a broad exploratory (qualitative) phase aimed at detecting types of interaction between different teachers according to the subject matter and their level of training, an observation system was developed based on a categorization of kinesic behaviour (Castañer 1999).

Despite the initial exploratory nature this is the most appropriate design for studying non-specific and intangible phenomena where the variables are still unknown (Creswell 1999; Creswell *et al*. 2003; Creswell and Plano Clark 2007).

### *Variants of the exploratory sequential design*

There are two variants of the exploratory sequential design: the *instrument development* model (emphasis on QUAN) and the *taxonomy development* model (emphasis on QUAL). Both start with a qualitative phase and then move on to a quantitative one, the difference being in how the researcher links the two phases (Creswell and Plano Clark 2007).

Researchers use the instrument development design (emphasis on QUAN) when they wish to develop and implement a quantitative instrument on the basis of previously obtained qualitative data. In this variant the qualitative and quantitative methods are linked through the phases of data collection, data analysis and results (see Figure 1.10).

Example 18

A study of children's exploratory motor behaviour in school play areas, without any direct intervention from monitors. A questionnaire was developed (QUAN) after an exploratory qualitative phase (qual) in which types of interaction were detected.

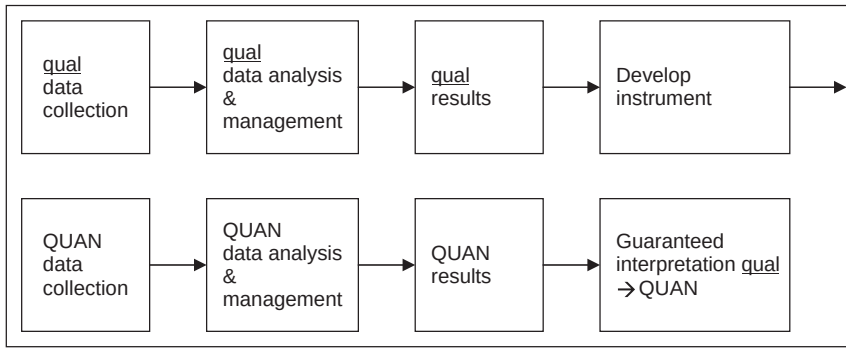


*Figure 1.10* Variant of the exploratory sequential design: the instrument development model (emphasis on QUAN) (adapted from Creswell and Plano Clark 2007: 76).

The first step is thus a pilot phase to explore the research problem with a small number of participants, and the results obtained are then used to guide the construction of items and scales for a survey instrument. In the second phase of data collection the researcher implements and validates this instrument quantitatively.

This variant is used when the researcher wants to emphasize the quantitative aspect of the study. In our field this kind of design is recommended when the aim is to generalize findings about the effects of physical activity on different groups so as to contrast and explore in detail the effectiveness of a programme. In these cases, considerable importance is placed on the qualitative information obtained regarding the effects of physical activity, this being a step prior to the development of quantitative indicators.

The taxonomy development design (emphasis on QUAL) is used when the initial qualitative phase enables the researcher to identify relevant variables, build a taxonomy or classification system, or develop an emergent theory. The purpose of the second, quantitative phase is then to test or explore these results in greater detail (Morgan 1998; Tashakkori and Teddlie 2003) (see Figure 1.11).

Example 19

A study of the needs of professional dance teachers in dance schools. The first exploratory step involved interviews (QUAL) to gather the opinions of dance teachers (both qualified and non-qualified but with sufficient experience, for example, at least ten years teaching) about their professional difficulties. This was followed by the construction of a taxonomy that enabled systematic observations (QUAN) to be made of their classes, thereby determining the obstacles they faced. The interpretation was based on contrasting the two types of data (QUAL → quan).

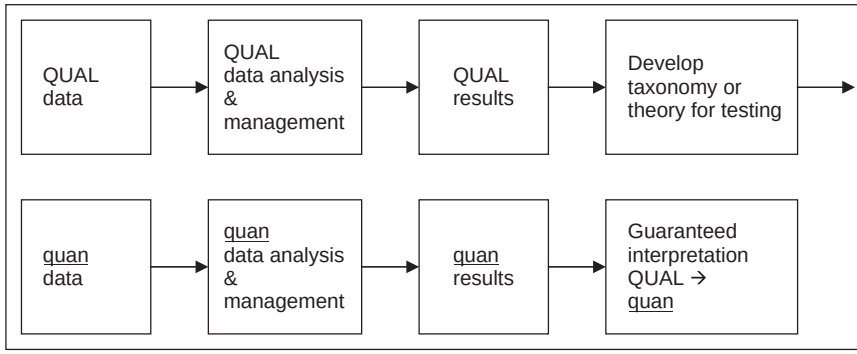


*Figure 1.11* Variant of the exploratory sequential design: the taxonomy development model (emphasis on QUAL) (adapted from Creswell and Plano Clark 2007: 76).

The initial qualitative phase gives rise to specific categories which serve to guide the second, quantitative phase of the study. It is also possible to identify emergent categories on the basis of the qualitative data, and then use the quantitative phase to explore the prevalence of these categories in different samples (Morse 1991).

### *Advantages and challenges in using the exploratory sequential design*

The exploratory sequential design has a number of advantages over other designs (Creswell and Plano Clark 2007), for example:

- The two phases are implemented separately.
- Although the design emphasises the qualitative aspect, the inclusion of a quantitative component makes it more likely to be accepted by audiences with a bias towards the quantitative model.
- This design is easy to apply in studies with different pilot stages and for instrument development.

However, it also presents a number of challenges:

- The two-phase approach is time consuming.
- Researchers need to decide which data from the qualitative phase will be used in developing the instrument, and how they will be employed to generate quantitative measures.
- Appropriate steps need to be taken to ensure that the instruments developed are valid and reliable with respect to the corresponding qualitative decisions and findings.

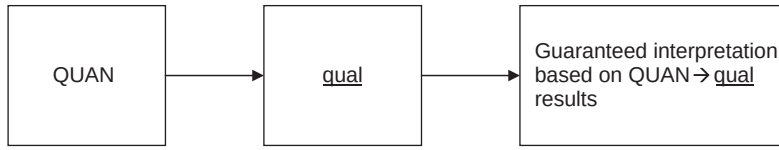


*Figure 1.12* Explanatory sequential design (adapted from Creswell and Plano Clark 2007: 73).

## Explanatory sequential designs

This is another two-phase design in which qualitative data are used to help explain and expand upon the quantitative results obtained initially (Creswell 1999; Creswell *et al*. 2003; Creswell and Plano Clark 2007) (see Figure 1.12). Although this design begins with a quantitative phase, researchers generally place greater emphasis on the qualitative aspect.

> Example 20
>
> A study of anthropometric and personality parameters among different athletes and their relationship to the specific sport being practised. The first stage would involve collecting data about the athletes' stature (QUAN) and personality using standardized tests so that they could be classified according to their measurements and personality traits. They would then be grouped together for the purpose of interviews (qual) aimed at detecting the reasons behind their sporting preferences.

In the context of physical activity this kind of design is used in studies with relatively large samples, especially when the researcher wants to begin by gathering quantitative data and, on the basis of this, form study groups which will be then be subjected to a qualitative analysis. Thus, the quantitative characteristics of participants guide the sampling process in the qualitative phase (Morgan 1998; Tashakkori and Teddlie 2003).

### *Variants of the explanatory sequential design*

There are two variants of the explanatory sequential design: the *follow-up* model (emphasis on QUAN) and the *participant selection* model (emphasis on QUAL). Both begin with a quantitative phase that is followed by a qualitative phase, but they differ in how these two phases are connected, as well as in the relative emphasis placed on each.

The follow-up explanatory design places greater emphasis on the quantitative data, which are used by the researcher to identify significant statistical differences between groups of participants, between individuals with extreme test scores, or in the case of unexpected results (see Figure 1.13).

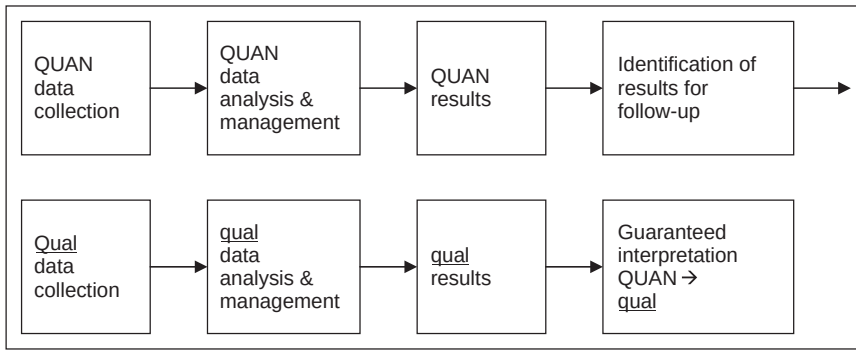


*Figure 1.13* Variant of the explanatory sequential design: the follow-up explanatory model (emphasis on QUAN) (adapted from Creswell and Plano Clark 2007: 73).

Example 21

A study of fitness levels among retired adults. The first step would involve gathering quantitative survey data (QUAN) from a stratified, random sample in order to identify factors related to their exercise preferences. In the second phase, multiple case studies (QUAL) would be conducted in order to explain why some of the factors identified in the first phase were significant predictors of adherence to physical activity programmes among retired adults.

The participant selection design, which emphasizes the QUAL aspects, is used when the researcher needs quantitative information to identify and adequately select participants for a subsequent, in-depth qualitative study (see Figure 1.14).

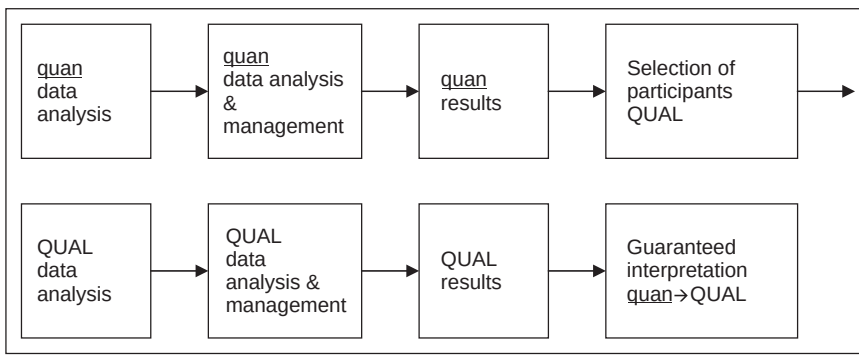


*Figure 1.14* Variant of the explanatory sequential design: the participant selection model (emphasis on QUAL) (adapted from Creswell and Plano Clark 2007: 73).

Example 22

A study about talent spotting in sport and the influence of family on an individual's success. The first step involved collecting quantitative survey data (QUAN) in order to identify types of families associated with elite sportsmen and women. A sample of these was then selected in order to conduct in-depth interviews (QUAL) and interpret the results (QUAN qual).

***Advantages and challenges in using the explanatory sequential design***

The advantages of the explanatory sequential design are:

- Its two-phase structure makes it easy to implement and there is no need for a team of researchers.
- The final report can be written in two stages.
- It is suitable for both multi-phase and single mixed methods research.
- It is appealing to quantitative researchers as studies usually begin with the collection of quantitative data.

The challenges faced by these designs are:

- Implementation of the two phases is time consuming. This is especially the case of the qualitative phase, although fewer participants are required here.
- Researchers need to decide whether to use the same participants for both phases, or if the two phases should draw their participants from the same sample or population.
- It may be difficult to gain approval from the local research review board as the number of participants required by the second phase cannot be specified until after the first set of results have been obtained.
- The researcher who collects the qualitative data is often the best placed to understand in greater detail the results obtained.

## ADVANTAGES AND CHALLENGES RESULTING FROM THE USE OF MIXED METHODS

Having described the various designs that result from the application of mixed methods it would now seem appropriate to try to consider objectively the overall benefits and drawbacks of this approach. As regards the specific context of research on sport, physical education and dance it should be said that the verdict is a positive one, and this should encourage researchers to promote the use of mixed methods so as to achieve more efficient results and applications in this field.

The main advantages or benefits of using mixed methods designs have been widely discussed by various authors (Creswell *et al*. 2003; Todd *et al*. 2004) and can be summarized as follows:

- They offer a fuller, more holistic view of the behaviour or episode under study, with various levels or dimensions of the research problem being explored. As stated by Lincoln and Guba (2000) this implies a more objective and comprehensive view or snapshot of reality, while remaining close to the study context (Harré and Crystal 2004) and offering greater explanatory power (Miles and Huberman 1994).
- The approach pays specific attention to problem formulation and the conceptual framework (Brannen 1992), which must be sensitive to the competing perspectives and establish connections between them. This contrasts with the more simplistic approach that involves just one way of considering the research question (Todd *et al*. 2004).
- The data obtained are much richer as there are no limits in terms of their source or the nature of the information.
- Mixed methods designs foster theoretical creativity through the use of numerous critical evaluation procedures (Clarke 2004).
- The enormous complexity of the real world can be better studied, taking into account the dynamic relationships that are established and the changing nature of reality. The combination of different methods (Mingers and Gill 1997) makes researchers better equipped.
- The combination of methods offers greater opportunities to extend the scope of a study (Morse 2003; Newman *et al*. 2003).
- Mixed methods designs can offer more robust support for scientific inferences than would be the case if the methods were used in isolation.
- A greater and better exploration and exploitation of data can be achieved (Todd *et al*. 2004).
- They enable a more suggestive presentation of results (Todd *et al*. 2004), as more than just numerical tables are used.

Both individually and as a whole, the above aspects clearly illustrate the enormous benefits of mixed methods designs. However, there are also a number of important challenges that remain to be met through future developments:

- Conducting mixed methods research requires training in both qualitative and quantitative methods, something which is still not common given that the research tradition in recent decades has clearly distinguished between the two (Todd and Nerlich 2004).
- Clear criteria need to be established for evaluating mixed methods studies. To date, the criteria for evaluating quantitative studies have been much more clearly defined than those for qualitative research, although work on the latter has developed in recent years (Sandín 2000, 2003; Onwuegbuzie and Johnson 2006).

# Mixed Methods Procedures and Designs for Research on Sport, Physical Education and Dance


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## Detecting Hidden Patterns in the Dynamics of Play in Team Sports

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