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Dimensional Analysis: A Second Generation Version of Grounded Theory Approaches

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Article Info	Abstract
<p>Article type: Research Article</p> <p>Received: 14 Apr 2024</p> <p>Accepted: 22 June 2024</p> <p>Published online: 22 June 2024</p>	<p>In the realm of sports science research, familiarity with qualitative research methods and their specific strategies, such as Grounded Theory (GT), is crucial for conducting research and developing valid scientific theories. There are various versions of GT that can be classified into two categories: first generation (Classic, and Systematic) and second generation (Constructive, Situational Analysis, and Dimensional Analysis). The attention of sports science researchers has grown significantly over qualitative research, especially using GT. However, it is evident that a predominant portion of existing research has employed first-generation GT versions. Further exploration of different versions of GT can play a significant role in selecting an appropriate version and presenting a more enriched theoretical framework. Consequently, this study introduces Dimensional Analysis (DA) as a second generation version of GT. This paper begins with a brief overview of the background, philosophical foundations, and emergence of DA, followed by a discussion and examination of the process of implementing DA.</p>
<p>Keywords:</p>	<p>Differentiation, Dimensional analysis, Dimensionalization, Grounded theory, Integration</p>
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Introduction

Humans endeavor to understand themselves and the world they inhabit better. One of the most effective methods employed for this purpose is scientific research. Scientific research is conducted using various quantitative, qualitative, and mixed-method approaches. Qualitative research methods (such as content analysis, action research, case study, ethnography, phenomenology, and grounded theory) have expanded and gained popularity in recent decades. Until the 1970s, there was a prevailing belief in the limited explanatory power of qualitative methods, with a dominant view considering quantitative studies as the sole form of systematic scientific research. At this critical juncture in the history of social sciences, Grounded Theory (GT) has emerged as a powerful response to such perspectives. Perhaps, if this pivotal moment had not occurred, we might not have witnessed the flourishing and ascendancy of qualitative research today (Harrison et al., 2015; Chenail, 2009; Thai et al., 2012; Danaeifard & Emami, 2007).

GT is a form of inductive research with a qualitative approach and an exploratory method (Harrison et al., 2015; Fernández, 2003; Engward, 2013). It provides researchers with the opportunity to extract a theory from collected data when there is no theory or existing theories are inadequate for explaining the phenomenon under investigation (Seldén, 2005; Farastkhah, 2021). This is achieved through systematic data collection and inductive analysis (Harrison et al., 2015; Thai et al., 2012). Such a theory can be genuinely effective and efficient in practice, offering a suitable description and explanation of the studied phenomenon (Danaeifard & Emami, 2007; Trotta, 2007). GT, rooted in the symbolic interactionist perspective, is designed to generate theory from data (Abendroth et al., 2012; Harrison et al., 2015; Thai et al., 2012).

GT was introduced by two sociologists named Barney Glaser and Anselm Strauss, who were conducting research in the field of nursing and gerontology at the University of California, focusing on the sociological aspects of the dying process. From a sociological perspective, they conceptualized the phenomenon of terminally ill patients in the context of dying and introduced a new method during this study. The results of their study were published in a book entitled "Awareness of Dying" in 1965. The publication of this book attracted considerable attention from researchers, leading to a flood of inquiries and requests regarding the methodology used in their research. In response to these requests, Glaser and Strauss published another book titled "Discovery of Grounded Theory" in 1967, in which they elaborated on the fundamental concepts and principles of their methodology (Fernández, 2003; Seldén, 2005; Danaeifard & Emami, 2007; Lal et al., 2012; Kenny & Fourie, 2014). Although GT's primary roots were in nursing and clinical psychology, its exceptionally flexible nature allowed it to quickly spread to other social sciences.

Following the publication of their collaborative study, Glaser and Strauss adopted various approaches, and their perspectives on GT significantly diverged, each offering a distinct interpretation (Seldén, 2005; Babchuk, 2011; Kenny & Fourie, 2014). Glaser's approach to GT is known as the Glaserian or emergent design, while Strauss, along with his collaborator Corbin, introduced the systematic or Straussian approach (Thai et al., 2012; Timonen et al., 2018). These two approaches fall under the first-generation versions of GT (Bowers & Schatzman, 2021). Despite their advantages, these initial approaches have specific limitations and weaknesses. For instance, the meticulous coding of data and attention to details may lead to researcher bias and potential repercussions (Seldén, 2005; Babchuk, 2011). In fact, the coding process in the initial approaches of GT, especially in the Straussian approach, tends to overlook individuals' natural inclinations for sociological exploration (Hadley, 2017). Additionally, excessive concern about avoiding any preconceptions about the study subject is another limitation that might result in insufficient awareness and understanding of the studied phenomenon (Seldén, 2005). For this reason, some scholars question the insistence of GT to enter the research field with an empty mind. They argue that a deliberate delay in reviewing prior research (and consciously withholding knowledge) may lead to exploration, but it can also cause the neglect of certain evident aspects of a specific phenomenon (Hadley, 2017). The existence of such limitations paved the way for the development and proliferation of new versions of GT over the decades. Indeed, in subsequent decades, researchers and scholars, mainly disciples of Glaser and Strauss, sought to address the gaps or shortcomings of the initial versions by proposing procedures for theorizing. These approaches are referred to as second-generation versions of GT (Bowers & Schatzman, 2009; Bowers &

Schatzman, 2021). Dimensional Analysis (DA) is one such example of the second-generation versions introduced by Leonard Schatzman.

A simple search across various scientific journals and databases in the field of sports science indicates a substantial growth in researchers' interest in qualitative research, especially using GT strategies, in recent decades. However, it is evident that the majority of these studies predominantly employ first-generation versions of GT (systematic and classic approaches), with few studies using second-generation versions. Additionally, an extensive search by researchers in scientific databases, particularly in sports science journals, revealed that only two studies have been conducted in Persian using Dimensional Analysis Grounded Theory, one of which has been conducted in the field of urban planning by Safari (2021) and the other in the field of sport by Hashemi Afousi (2022). Therefore, the introduction of this approach is deemed particularly necessary.

Researchers in sports science, given their interest in GT, require a deeper understanding of this method and its execution. Considering the various methods within GT and its family of methods (Babchuk, 2011; Timonen et al., 2018), careful consideration must be given to selecting the type of GT that aligns with the research and researcher. The mismatch between the type of GT and the research or researcher can compromise the credibility of the results (Engward, 2013). Furthermore, the differing opinions on GT and the multiple versions resulting from these differences may pose challenges for researchers in selecting an appropriate version. Familiarity with these methods can be instrumental in choosing the suitable version and presenting a more enriched theory. Therefore, in this study, GT-DA is introduced with the hope of heralding more effective research in the field of sports science.

Dimensional Analysis Emergence and Evolution

After Glaser and Strauss parted ways, each pursuing different paths, a new and modified version of GT was introduced at the University of California, the birthplace and origin of GT (Shankar & Goulding, 2001; Kools et al., 1996). This innovative interpretation of GT, known as the Dimensional Analysis approach, was introduced by Leonard Schatzman in 1991. Schatzman was the first graduate student of Strauss, and after completing his studies, he worked as his collaborator. The beginning of Glaser's collaboration with Strauss led to a diminished collaboration between Schatzman and Strauss (Bowers & Schatzman, 2009). Schatzman believed that the GT strategy presented a revolutionary method for working with qualitative data but expressed his concerns about the GT analysis process (Hadley, 2017). With the intention of making the theory development process more accessible to students, based on his observations while teaching at the University of California and guiding students using GT in their theses, he concluded that the procedures outlined by Glaser and Strauss (1967) lacked a general structure for analysis. His primary criticism of GT is that in this method, the operations leading to theory discovery are not well elucidated, and the process of discovering theory is not adequately explained (Shankar & Goulding, 2001; Trotta, 2007; Bowers & Schatzman, 2009; Lal et al., 2012).

Schatzman devoted considerable time to better understanding the nature and process of analysis. For this purpose, he observed the everyday analyses of humans and how they solve problems, noting that humans employ strategies and approaches created and developed early in their social life for discovering or resolving various issues and phenomena, not only scientific analyses (Robrecht, 1995; McCarthy, 2003a; Bowers & Schatzman, 2009; Bowers & Schatzman, 2021). Using this approach, known as natural analysis, humans elaborate on their concepts and experiences and define situations dimensionally, as this method proves more effective in understanding complex issues and topics. Dimensionalization allows humans to observe phenomena with their complexities, distinguish between them, and compare one thing to another. In other words, humans identify a phenomenon by recognizing its different dimensions and features (Bowers & Schatzman, 2009; Bowers & Schatzman, 2021).

Schatzman expanded and developed natural analysis, conceptualizing and presenting DA on the basis of it. Consequently, DA is sometimes referred to as natural analysis (Robrecht, 1995; Kools et al., 1996; McCarthy, 2003b). Schatzman's DA approach shares similarities with George Kelly's Personal Construct Theory. In this theory, individuals are considered novice scientists who test their theories about the world around them through personal and empirical experiences (Hadley, 2017). The distinguishing feature of DA

as a scientific analytical method from the natural analysis process is that in DA, the studied phenomenon is more attentively and thoroughly examined with additional characteristics and features (both in terms of type and quantity) (Robrecht, 1995; Shankar & Goulding, 2001). Moreover, like the initial approaches of GT, DA has its roots in symbolic interactionism (Schatzman, 1991; Bowers & Schatzman, 2009). Thus, symbolic interactionism and natural analysis form the philosophical foundations and theoretical framework of DA (Schatzman, 1991; Kools et al., 1996).

After Schatzman developed the DA approach, he dedicated many years to teaching it at the University of California, introducing numerous students to this method (Hadley, 2017). Following approximately three decades of teaching this approach, Schatzman decided, in 1991, to introduce the DA method to the scientific community at large (Schatzman, 1991). He teaches DA as a method that not only effectively demonstrates the theory discovery process (compared to the initial approaches of GT) but also possesses a more structured analysis process than those approaches (Shankar & Goulding, 2001; Trotta, 2007). DA is an alternative version of GT, but unlike other versions, it has been less widely used, and Schatzman's role in this area remains somewhat understated (Kools et al., 1996). Although recent years have seen an increase in researchers' attention to this approach through publications by Schatzman's students (Robrecht, 1995; Kools et al., 1996; McCarthy, 2003a; McCarthy, 2003b; McCarthy et al., 2004) and chapters in scientific books (Bowers & Schatzman, 2009; Bowers & Schatzman, 2021), DA has not been extensively applied in sports science research, especially domestic studies. Therefore, the present study aims to explore and introduce DA into this context.

The method for conducting research using the DA method (steps of DA)

DA serves as a methodological entry point to investigate a phenomenon comprehensively. In this approach, the researcher undertakes an analytical and dissecting exploration of the overall complexity of a phenomenon or situation. Grounded in data and evidence, the researcher systematically delineates and labels each aspect and dimension of the studied phenomenon, constructing a conceptually organized atlas without getting trapped in fragmenting or dissecting the entirety of the phenomenon. Once all dimensions involved in the phenomenon are identified, the researcher highlights and determines the significance of each dimension. The researcher selects the dimension that holds the greatest potential and capability for describing and explaining the phenomenon. Subsequently, on the basis of this chosen dimension, the researcher elucidates and describes the relationships between the other dimensions. Schatzman metaphorically likens this process to the intricate and refined choreography of ballet dance, referring to it as "choreography." It is as if, beyond the researcher's mind, a complex and interwoven dance of reality unfolds, and the researcher endeavors to, with analytical proficiency, unveil and explain the pattern of this dance (or the overall complexity and interwoven nature) – how it spins, moves up and down, forward and backward, sways, bends and straightens, strikes a pose, and twirls, etc. (Schatzman, 1991; Kools et al., 1996; Farastkhah, 2021; Bowers & Schatzman, 2021).

DA, like other versions of GT, involves numerous iterations, and many of its procedures occur simultaneously. Consequently, the stages and steps outlined for this method are nonlinear and solely presented to provide a clear depiction of the data analysis process and enhance the understanding of the presented content (Kools et al., 1996; McCarthy et al., 2004). Thus, DA unfolds in three nonlinear steps as follows:

1- Designation or Dimensioning: DA commences with posing a broad question: What 'all' is involved here? Or what are all the things involved in the studied phenomenon? In contrast to Glaser and Strauss (1967), who inquire about "What is the main concern here?", Schatzman (1991) emphasizes that the analyst should seek an answer to the question "What all is going on here? Or what all is involved?" (Schatzman, 1991; McCarthy et al., 2004; Bowers & Schatzman, 2009). A researcher utilizing DA must prioritize addressing this pivotal question, striving to identify and discover all dimensions and inputs about the studied phenomenon from the data (which may include field notes, interviews, published documents, etc.). This enables the recognition and differentiation of various dimensions and the creation of a conceptually organized atlas to describe and expound comprehensively on the studied phenomenon (Trotta, 2007; Hadley, 2017).

The aim of this abstraction stage is to conceptualize various aspects of the examined phenomenon (Schatzman, 1991). To achieve this, the researcher initially engages in a review and reexamination of the data to gain a general and comprehensive understanding. Subsequently, the data are examined and analyzed line by line, and the process of designation and dimensioning is performed (Abendroth et al., 2012). Designation or dimensioning refers to a process in which observed dimensions and features in the data are labeled, and codes are assigned to them (Shankar & Goulding, 2001; McCarthy, 2003b). The term "dimension" is applied to an abstract concept with one or more features that provide various parameters and criteria (quantitative and qualitative) to describe and explain the studied phenomenon or situation (Goulding, 2002; Hadley, 2017). For example, "gender" is a dimension with characteristics of female and male. Similarly, "mental illnesses" can be considered as a dimension that conceptually classifies into various sub-dimensions such as disease symptoms, frequency of symptoms, duration of occurrence, and manifestation, each of which can be specified by a set of features. Thus, each dimension constitutes one of the components of the studied phenomenon. Therefore, it can be said that dimensions in DA are analogous to concepts in conventional and traditional GT approaches (Classic or Systematic approaches) (Schatzman, 1991; Bowers & Schatzman, 2021). Each dimension comprises sub-dimensions (sub-concepts), and each of these sub-dimensions is precisely and specifically described by the features it can embrace (Kools et al., 1996).

From Schatzman's perspective, dimensioning is nearly equivalent to what Glaser and Strauss have termed open coding, with the difference that in DA, all codes take the form of dimensions without necessarily being related to the structure, process, context, conditions, or outcomes. In other words, dimensions are created regardless of their importance and prominence, and no relative significance or specific meaning is attributed to any of the dimensions and their features, as the researcher is still unaware of their relative importance or insignificance and cannot examine and evaluate their prominence or insignificance and the relationships between them. In this stage, the analyst is in search of "everything" involved in and related to this phenomenon and is merely seeking to understand the dimensions, not determine the importance or meaning of things (McCarthy, 2003a; McCarthy, 2003b; Hadley, 2017). This reflects the neutral standpoint and impartial view of the researcher toward the data in this stage of analysis (McCarthy, 2003b; McCarthy et al., 2004).

Due to the designation stage, a conceptual atlas of dimensions is created to continue the analysis process, and the researcher moves toward an abstract representation of the situation or phenomenon (Shankar & Goulding, 2001). Having identified the initial dimensions, the researcher attempts to ask more focused questions in subsequent interviews to elaborate on the identified dimensions. If there is a need to delve deeper into a specific dimension, the researcher should focus on finding relevant examples to gather more information about it. Essentially, the researcher, relying on the theoretical sampling protocol, determines whether there is a need for a specific selection of interviewees. If the data do not indicate a specific theoretical statement that requires attention through the defined sampling, the researcher continues the search for examples with the primary parameters (Schatzman, 1991). When new dimensions are identified in subsequent interviews, the researcher also examines previous interviews to determine whether or not what has recently been identified exists in previous interviews. This continuous comparison of data leads to the expansion of data and the creation of a clear conceptual classification (Abendroth et al., 2012; McCarthy, 2003b).

Data collection process should continue until reaching critical mass and theoretical saturation. When the researcher acquires a sufficient amount of data that enables the elucidation and description of the major aspects of the phenomenon under study (having adequately understood the scope and complexity of the subject), this is referred to as reaching a critical mass of dimensions (Kools et al., 1996; Shankar & Goulding, 2001; Jacobson, 2001). At this point, the researcher must consider whether the data provide new dimensions and features. If no new dimensions or features are identified from the data and participant responses become repetitive (theoretical saturation), sampling and interviews are terminated (Abendroth et al., 2012). Theoretical saturation is, in fact, dependent on the quality of the obtained data and not the quantity of interviewees (Lal et al., 2012). To ensure theoretical saturation, a few additional interviews were conducted. Upon confirming theoretical saturation, the sampling is halted. After reaching the critical mass and theoretical saturation, the researcher enters the second stage of analysis (the differentiation stage).

Let's walk through the first stage of DA (Designation or Dimensioning) using an example from sport management (drawn from Hashemi Afousi (2022) doctoral thesis). Imagine we are studying how professional retired athletes adjust with retirement course. We begin with a set of qualitative data such as interviews with retired athletes. We break this data down into smaller pieces (codes) that capture key aspects or themes related to retirement adjustment.

For example:

- A retired athlete interview named V: "I was severely injured. By the time I healed and recovered, it was too late and I couldn't be the same person again."

Code: Involuntary reason for retirement

- A retired athlete interview named W: "I was offered a good job, but I thought it was the right time to move on. I had also achieved what I wanted in sports."

Code: Voluntary reason for retirement

- A retired athlete interview named X: "I was mentally disturbed. I was restless and felt like I had lost something. I had no income and no skills."

Codes: Psychological problems, Job-related problems.

- A retired athlete interview named Y: "Personally, I wasn't prepared for retirement at all. I mean, I didn't have any specific plans for it, and I hadn't really thought about it much."

Code: Pre-retirement planning.

- A retired athlete interview named Z: "Being involved in coaching and sports really helped me deal with it sooner."

Codes: Transferable skills, Accumulated experiences.

This process continues in this manner, and the codes are extracted and named. In Hashemi Afousi's research, 1128 initial codes were extracted from 22 interviews with retired athletes. Next, we identify sub-dimensions by grouping similar codes or similar initial dimensions and labeling them with broader, more abstract categories that capture their essence. These sub-dimensions represent significant properties or aspects of the phenomena we are studying.

For example, the codes for voluntary reasons and involuntary reasons are placed in a group under the heading of retirement reasons. Similarly, the codes for psychological problems, job-related problems, physical problems, family problems, social problems, and release from training pressure are also placed in a group under the heading of retirement consequences. This process is repeated, and similar sub-dimensions are placed in a group to form a main dimension. For example, the sub-dimensions of retirement reasons and retirement consequences are placed in a main dimension under the heading of issue or problem.

In the aforementioned study, other similar sub-dimensions were grouped together to form additional dimensions. For example, the sub-dimensions of knowledge and experience, personality traits, and demographic characteristics formed the main dimension named individual. Other main dimensions of this study include significant others, the sports system, and society. In total, 14 sub-dimensions were identified in this study and were placed under the 6 main dimensions (Issue or Problem, Individual, Significant others, Sport system, Society, Re-socialization).

In summary, at the first stage of DA, we move from raw data to identified dimensions by coding the data and grouping similar codes together. This process helps us highlight key aspects of our research topic—in this case, adjustment to sport retirement—and sets the foundation for deeper analysis in the subsequent stages.

2-Differentiation: Once the researcher is certain that they have obtained a sufficient amount of data to explain the important and major aspects of the phenomenon (reaching a critical mass), the importance of

dimensions is determined (Kools et al., 1996; Robrecht, 1995). In other words, after reaching a critical mass and answering the question, which aspects play a role in this phenomenon? (Schatzman, 1991), the researcher enters the second stage of analysis, which Schatzman calls the differentiation stage.

During this stage, the researcher should restrict the data previously expanded and developed. This action is performed through a perspective or central dimension (McCarthy, 2003b; McCarthy et al., 2004). Indeed, the key to the DA method is the selection of a perspective because everything depends on the lens through which the phenomenon under study is examined. From different perspectives, the studied phenomenon appears different, its features change, and the prominence and importance of each dimension will seem different, resulting in different outcomes (Jacobson, 2001; Goulding, 2002). In other words, each perspective provides a different configuration of the data, tells a different story, and, when chosen as the central dimension, transforms into a context that shapes the narrative based on it, making the studied phenomenon comprehensible (Shankar & Goulding, 2001). Therefore, the selection of a perspective holds special significance in DA as it guides research and aids in interpreting the data (Trotta, 2007; McCarthy, 2003b).

Selecting a perspective necessitates that the researcher has an open mind regarding a set of possible theoretical positions to choose a perspective that offers the best and most acceptable explanation for the studied phenomenon. This implies that the researcher, relying on his or her previous knowledge and experiences and reviewing the research background, can examine the proportion and relationship of one dimension to other dimensions. With the support of theoretical frameworks, they can determine the importance of dimensions and construct a narrative. Schatzman even argues that researchers must possess sufficient knowledge and understanding to allocate values to concepts, identify dimensions, and place them in meaningful clusters and appropriate categories (Schatzman, 1991; Goulding, 2002). In selecting a perspective, each dimension should have the opportunity and chance to take the position of a perspective. Depending on the position they find, they may dominate over other dimensions, subjecting them to their influence (Schatzman, 1991). In other words, a competitive situation should be created among dimensions in choosing the perspective (McCarthy, 2003b; McCarthy et al., 2004). For this purpose, Schatzman (1991, p. 308) has proposed the explanatory matrix (Figure 1).

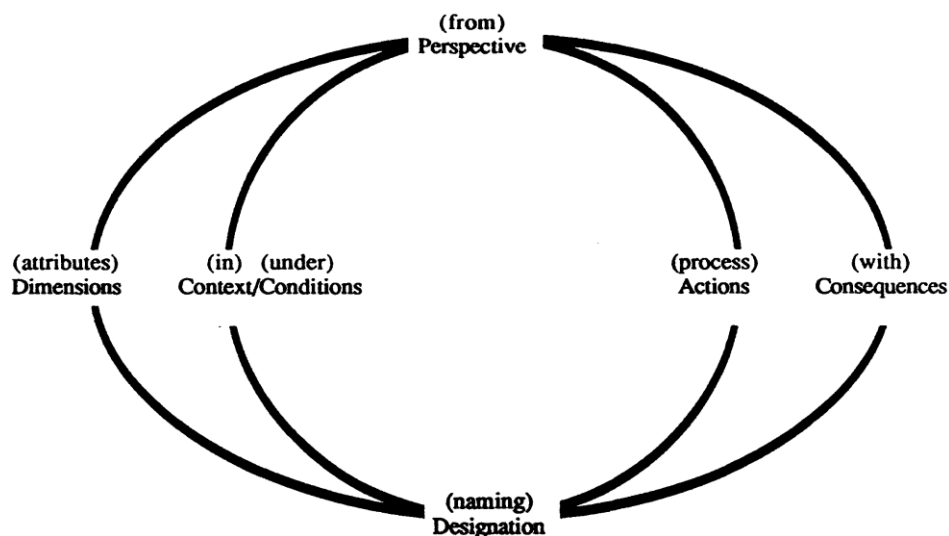


Figure 1. Explanatory matrix (Robrecht, 1995)

The explanatory matrix is the cornerstone of the DA process, serving as a mechanism to structure the analytical process. Essentially, the explanatory matrix represents an initial model or pattern of theoretical structure and assists the researcher in distinguishing dimensions based on their characteristics. Prominent dimensions are organized along the explanatory matrix, and the researcher arranges them (as perspective, conditions, process, context, and outcomes) in a logical framework, shaping the emerging theory. Once the researcher can elucidate the studied phenomenon through a dimension, that dimension becomes the perspective (McCarthy, 2003b; McCarthy, 2003a; McCarthy et al., 2004; Trotta, 2007; Hadley, 2017). In this matrix, the researcher allows each dimension to take on the role of a perspective and govern over other

dimensions. This action provides equal opportunities for identified dimensions to act as perspectives and research guides, allowing them to test their chances. Thus, this stage creates opportunities for analytical permutations and various scenarios (varied outcomes), and the analyst is obligated to choose, through purposeful examination and comparison among different dimensions, which of these possibilities (outcomes) can be the most useful and beneficial option (Jacobson, 2001). Ultimately, this leads to the final selection of a dimension as the central dimension or perspective. The choice of perspective guides research and data interpretation, acting as a catalyst for theoretical conceptualization in the emerging theory (McCarthy, 2003b). After selecting the central dimension (perspective), other dimensions take on roles as conditions influencing the process or as outcomes in the explanatory matrix (Schatzman, 1991).

Let's continue with our example from sport management, focusing on the sport retirement adjustment. In this stage, we begin to understand the specific attributes of each dimension.

Once we have ensured that we have access to a sufficient amount of data to reflect the important and major aspects of the phenomenon of adaptation to retirement in the analysis, we proceed to determine the importance of the dimensions. We refer to the research background and compare the main dimensions and sub-dimensions obtained from our study with previous research. For example, a review of previous research reveals that retirement reasons play a significant role in retirement problems. It also shows that the sports system can play an important role in reducing or increasing retirement problems; parents, coaches, friends, siblings, or significant others can play an important role in reducing the consequences of retirement; and the athlete or individual also has characteristics and properties that can be important in adapting to retirement, either individually or in interaction with other dimensions. It is also evident that the interaction of these dimensions can provide a context for the re-socialization or adaptation of athletes to retirement, or can lead to the unsuccessful adaptation of retired athletes. In other words, if socialization is considered as the perspective dimension, an appropriate explanation of this phenomenon can be obtained. This process is repeated over and over again, and each of the dimensions is placed in the perspective role to determine which state provides a better and more accurate explanation of the phenomenon under study.

In fact, after reaching a critical mass, an explanatory matrix is formed to compare the dimensions with each other and to determine the importance and role of each dimension. The selection of the central dimension (perspective) carries out the separation process, in the sense that after selecting the central dimension, the other dimensions are separated within the explanatory matrix and different explanatory scenarios begin. In the present example, when the dimension of socialization or adaptation is placed in the role of the perspective dimension, the other dimensions are placed in different roles and different explanations of the topic are presented. This process is repeated over and over again until the best and most appropriate explanation is obtained. For example, as Hashemi Afousi (2022)'s research shows, the four dimensions of the individual, society, the sports system, and significant others, in interaction with each other, can both influence the problem or issue and be influenced by it, and a two-way interaction exists between them. In another explanation, it may only be stated that the aforementioned dimensions affect the problem dimension, or only the sports system, significant others, and society dimensions affect the problem. In any case, according to the perspective dimension, i.e., re-socialization, the other dimensions should be placed in their best position, and the importance and role of each one should be selected in the best way possible based on the data, analytical notes, and research background. The relationship of other dimensions with this dimension should be determined, and finally, a narrative of the phenomenon under study should be formulated based on it.

By examining these interrelationships, we gain a deeper understanding of how athletes adjust to retirement course, allowing us to develop a nuanced theory. Actually in this stage we should refine and organize our dimensions, clarify their specific attributes, and explore the relationships between them. This process helps us build a comprehensive understanding of the phenomena, setting the stage for developing a grounded theory that explains how athletes adjust to retirement.

3- Integration: In the subsequent phase of the analysis process, referred to as integration by Schatzman, the researcher must strive to illuminate the emerging theoretical connections between dimensions. In other words, the researcher needs to explicitly articulate the relationships between dimensions and express logical

consequences or outcomes (Schatzman, 1991; McCarthy, 2003b). During this stage, the analyst, guided by the perspective dimension, should systematically arrange the other dimensions like different pieces of a puzzle or story, reconstruct and complete the narrative (McCarthy, 2003b), and present the theory derived from the data as a coherent report (Hadley, 2017).

Once conceptual connections are established, and the theory is formulated, the researcher must scrutinize and analyze the research background concerning the identified dimensions. To challenge and validate the emerging theory, the researcher needs to revisit and reanalyze a portion of the data in this phase. Additionally, the researcher should document conceptual notes (internal dialogues within the researcher expressed in written notes used throughout various stages) to affirm the credibility of the examined theory. Furthermore, in this phase, the researcher should present and examine conversations with peers to validate the applied theory. Lastly, the researcher should conduct discussions with a few interviewees to assess the theory's validity (Kools et al., 1996; McCarthy et al., 2004; Abendroth et al., 2012; Farastkhah, 2021). In the final step, the researcher compares the emerging theory from the data with existing theories (theoretical generalization) and subjects their theory's validity to rigorous testing (Farastkhah, 2021).

Thus, the output and product of DA constitute a theory grounded from the data. This theory organizes and categorizes dimensions extracted from the data, interpreting these dimensions based on the central dimension (McCarthy et al., 2004). The presented theory, using this approach, can provide a suitable explanation and elucidation for the phenomenon or situation under study in the form of a figure or diagram. Alternatively, even without a graphical representation, it can be considered, at best, as a comprehensive description and explanation (Schatzman, 1991).

Let's proceed with the final stage of DA using our example of studying the sport retirement adjustment. In this stage, the core category (re-socialization) should be central to understanding the phenomena (sport retirement adjustment) and should link all the dimensions together. With the core category identified, we now develop a grounded theory that explains how retired athletes adjust to retirement course (Figure 2). This involves synthesizing our findings and articulating the relationships between the dimensions in a coherent narrative. Here's a possible theoretical explanation:

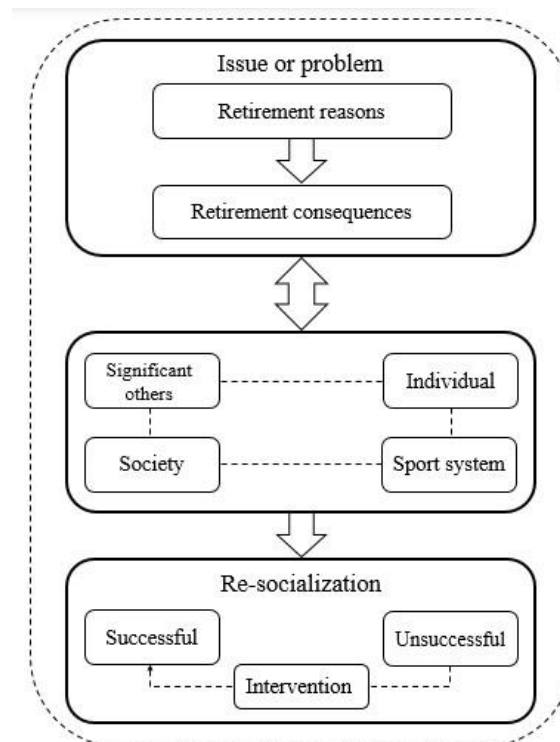


Figure 2. Sport retirement adjustment theory

Based on the current theory, it is observed that athletes retire from sports for various reasons, either voluntarily or involuntarily (or a combination of both). Typically, there is more than one reason for an athlete's retirement from sports, although in some cases, a single predominant reason may exist. Following retirement from sports, athletes face the consequences of retirement, which can be positive, negative, or a combination of both. As evident in the research model, the consequences of retirement are influenced by the reasons for retirement, and there is a relationship between them.

There are multiple dimensions and factors that interact to facilitate athletes' adaptation to retirement. These dimensions include the individual, significant others, the sports system, and society. Each of these dimensions comprises various sub-dimensions. For example, the main dimension of the "individual" consists of sub-dimensions such as "knowledge and experiences, personality traits, and demographic characteristics." These dimensions surrounded athletes before and after retirement and therefore are both influenced by and can influence retirement. Consequently, a bidirectional relationship is considered in the presented theory. For instance, significant others can assist athletes by providing advice and support, helping them plan and prepare for retirement.

Each dimension in this grounded theory interacts with one another, and each can impact the other dimensions. For example, the dimension of "society" or the "sports system" can affect the "individual" dimension. An "individual" is educated, nurtured, and influenced by society while simultaneously having the potential to impact society. The interaction and connection of these dimensions create multiple scenarios, meaning each athlete may have a different retirement experience depending on the actions and interactions of these dimensions. If the interaction of dimensions leads to a balance between resources and obstacles (or causes resources to outweigh obstacles), athletes adapt to retirement more successfully. Conversely, if obstacles outweigh resources, athletes face a retirement crisis or failure to adapt, necessitating intervention to help them overcome the crisis.

This theory indicates that adaptation to sports retirement is a complex, multidimensional process influenced by various dimensions and factors that can directly or indirectly impact adaptation. The time required for adaptation and the level of adaptation depend on the appropriate interaction and balance of these dimensions. Therefore, by considering the different dimensions and the manner and direction of their influence, it is possible to optimally assist athletes in adapting to retirement.

As previously mentioned, it is necessary to compare the proposed theory with existing theories. For instance, in this example, it can be stated that the model presented in this research has similarities and differences with previous models and theories. This theory is based on the experiences of retired athletes and has better applicability compared to social gerontology theories developed in non-sporting communities. Additionally, it considers the role of various factors such as the environment, individual characteristics, and societal structure, which have not been addressed in social gerontology theories, yet they can play a significant role in adaptation to retirement. The present research theory offers a multidimensional and holistic perspective on the phenomenon of sports retirement, compensates for the shortcomings and weaknesses of previous theories, discusses the potential for both successful and unsuccessful transitions based on different variables, and proposes interventions to transform a critical transition into a successful one. Lastly, this theory provides a nuanced understanding of retirement adjustment in professional athletes, offering valuable insights for retired athletes, coaches, sport psychologists, and sport management professionals.

In summary at the final stage of DA, we integrate our dimensions into a core category that explains the central phenomena. We then develop a grounded theory that articulates how these dimensions interact and influence the outcome—in this case, how retired athletes adjust to retirement course.

Conclusion

The article discusses Dimensional Analysis (DA) as a methodological approach used by researchers to gain a comprehensive understanding of complex phenomena. DA involves systematically identifying and labeling all dimensions of a phenomenon, selecting a central dimension for analysis, and determining the

relationships between dimensions to create a theory grounded in data. The process of DA unfolds in three nonlinear steps: Designation or Dimensioning, Differentiation, and Integration.

In the Designation stage, researchers aim to identify all aspects and dimensions of the phenomenon under study without attributing relative significance or meaning to them. This stage is akin to open coding in Grounded Theory, where dimensions are created regardless of their importance or prominence. The goal is to create a conceptual atlas of dimensions that will guide the analysis process and lead to a comprehensive understanding of the phenomenon.

Once a critical mass of dimensions is reached, researchers move to the Differentiation stage, where they determine the importance of each dimension and select a central perspective for analysis. This central dimension serves as the lens through which the phenomenon is examined, shaping the narrative and interpretation of the data. Different perspectives can lead to different outcomes and interpretations of the phenomenon, highlighting the significance of selecting the right perspective in DA.

Overall, DA serves as a methodological entry point for researchers to explore and understand complex phenomena comprehensively. By systematically delineating and analyzing dimensions, researchers can construct a conceptually organized atlas that elucidates the complexity of the phenomenon under study. The nonlinear nature of DA, with its iterative and simultaneous procedures, allows for a thorough and in-depth analysis of the data.

In conclusion, Dimensional Analysis provides researchers with a structured approach to unravel the intricacies of complex phenomena, leading to a comprehensive understanding and explanation grounded in data and evidence. Through the systematic identification and analysis of dimensions, researchers can create a theory that captures the complexity and interwoven nature of the phenomenon under study. While DA has been praised for its systematic approach and flexibility, it has also faced criticism. Here are some of the main critiques:

1. **Complexity and Overwhelm:** DA can be quite complex and overwhelming for researchers, especially novices. The process of identifying and analyzing dimensions can be intricate and time-consuming, potentially leading to confusion and inconsistency in application.

2. **Subjectivity:** Like other qualitative methods, DA is susceptible to subjectivity. The interpretation of dimensions and their relationships can vary significantly between researchers, which may affect the consistency and reliability of the results.

3. **Lack of Rigor:** Some critics argue that DA lacks the rigor of more structured quantitative methods. The flexibility and interpretive nature of DA may lead to questions about the validity and generalizability of the findings.

4. **Theoretical Sensitivity:** DA requires a high level of theoretical sensitivity from researchers, meaning they must be well-versed in the relevant literature and capable of making nuanced interpretations. This can be a challenging requirement, especially for less experienced researchers.

5. **Comparison with Other Methods:** When compared to other grounded theory approaches, such as the classic grounded theory method by Glaser and Strauss, DA might be seen as less standardized. This perceived lack of standardization can be a point of contention among methodologists.

6. **Implementation Challenges:** Implementing DA in practice can be difficult. Researchers may struggle with the practical aspects of breaking down and categorizing data into dimensions, leading to potential issues in the consistency and coherence of the analysis.

7. **Potential for Over-Analysis:** There's a risk of over-analysis in DA, where researchers might identify too many dimensions, leading to overly complex and fragmented theories that may be difficult to integrate into a coherent framework.

8. Training and Expertise: Adequate training and expertise are crucial for the effective use of DA. Critics argue that without sufficient training, researchers might misapply the method, resulting in flawed or superficial analyses.

Despite these criticisms, many researchers value DA for its depth and ability to uncover nuanced insights from qualitative data. Like any research method, its effectiveness largely depends on the skill and experience of the researcher and the context in which it is applied.

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Conflicts of Interest

There is no conflict of interest.

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