Taxonomic Theory and the ICF: Foundations for a Unified Disability Athletics Classification

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Development of a unified classification system to replace four of the systems currently used in disability athletics (i.e., track and field) has been widely advocated. The definition and purpose of classification, underpinned by taxonomic principles and collectively endorsed by relevant disability sport organizations, have not been developed but are required for successful implementation of a unified system. It is posited that the International classification of functioning, disability, and health (ICF), published by the World Health Organization (2001), and current disability athletics systems are, fundamentally, classifications of the functioning and disability associated with health conditions and are highly interrelated. A rationale for basing a unified disability athletics system on ICF is established. Following taxonomic analysis of the current systems, the definition and purpose of a unified disability athletics classification are proposed and discussed. The proposed taxonomic framework and definitions have implications for other disability sport classification systems.

Sport plays an important role in the lives of people with a disability, providing a valuable, self-directed means of augmenting rehabilitation outcomes as well as offering opportunities for recreation, social interaction, and the pursuit of athletic excellence. Systems of classification are an essential, yet controversial feature of disability sport, a fact recognized by many authors (Sherrill, 1999; Vanlandewijck & Chappel, 1996).

For a number of years, many athletes, coaches, and administrators, both from within and outside disability athletics (i.e., track and field), have advocated streamlining the athletics classification by replacing four of the systems used at the 2000 Paralympic Games in Sydney with a single system. The four systems are those of the Cerebral Palsy-International Sport and Recreation Association (CP-ISRA; 2001), International Stoke Mandeville Wheelchair Sports Federation (ISMWSF; 1995, 2000), and International Sports Organization for the Disabled (ISOD; 1993). The latter has one system for amputees and one system for les autres. Several disability
sports, including swimming, table tennis, and equestrian, have already developed classifications that replace these four systems. However, the sport of athletics has taken only preliminary steps toward this goal.

In disability sport circles, these single classifications developed to replace the CP-ISRA, ISMWSF, ISOD (amputee), and ISOD (les autres) systems are referred to variously as integrated, functional, or sport-specific classifications. The term unified is preferred in this manuscript because it implies a synergistic bringing together, not only of rules and systems, but also of people and organizations; both must be achieved if a unified system is to become a reality.

While many political, logistical, and economic reasons drive the move toward a unified disability athletics classification, prerequisites for its development are statements that define its classification and its purpose. It is critical that the definition and purpose have a sound scientific and taxonomic basis and are articulated using language and definitions that are unambiguous and internationally recognized. This is important in order to provide athletes with the best and fairest system possible, but also because of the increasing incidence of legal challenges to the classification process and the escalating public and media scrutiny of disability sport events. The statements that define classification and its purpose must be recognized by each of the three international sports organizations concerned (i.e., CP-ISRA, ISMWSF, and ISOD). Currently, such statements do not exist, and the principal aim of this paper is to address this task.

This paper establishes the need for examination and development of the taxonomic principles underpinning disability sport classification. Following this, an analysis is made of the taxonomic features of the International classification of functioning, disability, and health (ICF), published by the World Health Organization (2001). In the analysis, the ICF is compared with the current classifications used in disability athletics and the common conceptual links between the systems are identified. Finally, the current disability athletics classification systems are reinterpreted using the language and structure of the ICF, and a definition and purpose of a unified classification system are proposed and discussed. While this paper focuses specifically on athletics, much of the theory explored has implications for other disability sport classification systems.

Research in Disability Sport Classification

The need for research on sport classification has been identified by several authors and disability sport organizations since 1986, when the Committee on Sports for the Disabled (a standing committee of the United States Olympic Committee) included classification among seven research priority areas in disability sport (DePauw, 1988; Doll Tepper, International Paralympic Committee Sports Science Committee, & International Federation of Adapted Physical Activity, 1994; Sherrill, 1999). A primary stimulus for classification research has been the concept of unified classification systems (Daly & Vanlandewijck, 1999; McCann, 1984, 1993; Richter, 1993; Richter, Adams-Mushett, Ferrara, & McCann, 1992; Riding, 1993; Sherrill, 1999; Vanlandewijck & Chappel, 1996; Wu & Williams, 1999).

To date, debate and analysis of unified classification systems have failed to recognize and take account of the fundamental importance of taxonomic theory. In this respect, the debate in disability sport has been typical of debate regarding classification issues in a wide range of scientific fields. Fleishman and Quaintance
(1984) maintain that, in general, scientists and researchers have tended to focus almost exclusively on the product of applying taxonomic theory (i.e., the formal set of classes or categories that result from classification), without placing sufficient emphasis on the process of applying taxonomic theory (i.e., the principles guiding the systematic arrangement of units into classes). In disability sport, this has meant that issues such as methods of assessment, equality, fairness, and the number of classes in specific systems have often been investigated, but little has been written by experts on what classification is, what its purpose is, and what is actually being classified. Lack of attention to taxonomic process and principles has meant that investigations of product issues in classification have often been predicated on principles that are merely assumed or surmised.

For example, while most experts in disability sport would probably agree that the purpose of classification should be to provide athletes with disabilities with an equitable starting point for fair competition (Richter et al., 1992), researchers making reference to the purpose of classification have erred by not citing sources, citing only secondary sources, or assuming the statements made by a single disability sport organization are accepted by others (Daly & Vanlandewijck, 1999; Higgs, Babstock, Buck, Parsons, & Brewer, 1990; McCann, 1984, 1993; Richter et al., 1992; Richter, 1993; Riding, 1993; Sherrill, 1999; Vanlandewijck & Chappel, 1996; Vanlandewijck, Spaepen, & Lysens, 1995; Wu & Williams, 1999). In this way, classification is an exemplar of Sherrill’s assertion that “disability sport is driven by many theories, most of which remain underidentified and underanalysed” (Sherrill, 1999, p. 207). If research and scholarly debate are to contribute to the refinement, validation, and clarification of disability sport classification in a rigorous, logical fashion, it is essential that taxonomically sound definitions and principles of classification that are endorsed by the relevant disability sport organizations are developed and published.

Taxonomic Theory, the ICF, and Disability Athletics Classification

In their seminal text on the development of taxonomic systems for the description of human tasks, Fleishman and Quaintance (1984) provide a comprehensive overview of the principles and practice of taxonomy and its wider role in the sciences. This classic work provides the basis of much of the taxonomic theory in this paper. Fleishman and Quaintance (1984) defined taxonomy as the “theoretical study of systematic classifications, including their bases, principles, procedures, and rules. The science of how to classify and identify” (p. 22). As a science in its own right, taxonomy gains meaning through its application to other fields (Fleishman & Quaintance, 1984). Classification systems in any field, including disability sport, should be based on the principles of taxonomy; if not, the systems will lack a sound theoretical basis. None of the literature reviewed for this paper applies or refers to the need for the application of the science of taxonomy in disability sport classification.

Classification is defined as “the ordering or arrangement of entities [or units] into groups or sets [or classes] on the basis of their relationships, based on observable or inferred properties” (Fleishman & Quaintance, 1984, p. 22). The primary purpose of a classification is “to describe the structure and relationships of the constituent objects in regard to each other and to similar objects, and to simplify
these relationships in such a way that general statements can be made about classes of objects” (Fleishman & Quaintance, 1984, p. 23).

There are many different systems of classification. These apply to a wide range of scientific fields and vary in scope, depending on the purposes for which they have been designed (Fleishman & Quaintance, 1984).

It is posited that the International classification of functioning, disability, and health (ICF) and the disability athletics systems are separate classifications that vary in scope but which are highly interrelated in terms of purpose. Therefore, there is a sound taxonomic rationale for developing close conceptual links between them.

### ICF: Description and Definitions

A brief description of the central concepts and structure of the ICF follows. Readers wishing to study the classification in detail are referred to the World Health Organization (WHO) website (http://www3.who.int/icf/icftemplate.cfm) that has a searchable on-line version of the ICF classification. The website also has details of how to order a print version of the ICF, which contains the full classification as well as supporting text, including definitions, and guidelines for use.

The WHO first published the *International classification of impairments, disabilities, and handicaps* (ICIDH) in 1980. In 1993, the WHO began a revision of the ICIDH, and in May 2001, the revised classification was endorsed by the 54th World Health Assembly and renamed the *International classification of functioning, disability, and health* (ICF). The overall aim of the ICF classification is twofold: to define and use a standardized language to describe health and health-related states and to provide a framework to code information about health and health-related states (WHO, 2001). The ICF advances and develops concepts in the ICIDH. Compared to the ICIDH, the ICF is more taxonomically sound, sensitive to the rights of people with disabilities, and sophisticated in its modeling of the complex interactions among health, people, and the context of this interaction.

The ICF uses neutral terminology. For example, the ICIDH classified the consequences of disease, while the ICF classifies components of health; these concepts are consistent but the latter is expressed in neutral terms. Also, in the ICF, the components body functions and structures, activities, and participation are used to organize information about health and health-related states. They replace, respectively, the ICIDH components of impairment, disability, and handicap and extend their meanings so they can describe both positive and negative aspects.

In the ICF, the term impairment is retained, but it refers only to problems in the body functions and structure component. The term disability is also retained but is redefined as one of two umbrella terms; disability refers to negative aspects of any of the components of health, while functioning, the other umbrella term, refers to the positive or neutral aspects. The term handicap is no longer used because of its pejorative connotations in English (WHO, 2001).

Figures 1 and 2 illustrate the conceptual and philosophical changes from ICIDH to ICF. The ICIDH model (see Figure 1) was widely criticized for implying simple cause and effect relationships between components and for indicating that the flow from impairment to disability to handicap was unidirectional (WHO, 2001). The ICF model (see Figure 2) depicts a complex interaction between the components of health, the health condition, and personal and environmental factors.
Figure 2 — Current understanding of interactions between components of the ICF. 1. Health condition is an umbrella term for disease, disorder, injury, or trauma; 2. Body functions are the physiological functions of body systems (including psychological functions) and Body structures are anatomical parts of the body such as organs, limbs and their components. Impairments occur at the body level are problems in body functions or structures; 3. Activity is the execution of a task or action by an individual or person. Activity limitations occur at the person level and are difficulties an individual has in executing activities; 4. Participation is involvement in a life situation. Participation restrictions occur at the level of society and are problems an individual has with involvement in life situations; 5. Environmental factors make up the physical, social, and attitudinal environment in which people . . . conduct their lives; 6. Personal factors are contextual factors that relate to the individual such as age, gender, social status and life experiences. Note. From International classification of functioning, disability, and health (p. 18) by WHO, 2001, Geneva: Author. Copyright 2001 by WHO. Reprinted with permission.

Further, WHO emphasizes that Figure 2 does not model the process of functioning and disability; rather, the process of functioning and disability is conceptualized as interactive and evolutionary. The ICF classification provides users with the building blocks needed to create models and study different aspects of the process of functioning and disability (WHO, 2001).
Figure 3 illustrates the overall structure of the ICF classification. The ICF classification has 2 parts. Each part has 2 components. The first part is (1) Functioning and Disability. Its components are (1.1) Body functions and structures and (1.2) Activities and participation. The Body function and functions component is divided into: (1.1.1) eight Body Function Domains, coded using the prefix b; and (1.1.2) eight Body Structure Domains, coded using the prefix s. Activities and participation (1.2.1), comprises 9 domains, coded using the prefix a or p or d to indicate activities, or participation, or both respectively. Qualifiers are used to indicate, for example, the extent of problems at issue. Activities and Participation has 2 qualifiers: performance that indicates problems in the person’s current environment; and capacity, which indicates limitation in a standardized environment. The second part of the ICF classification is (2) Contextual factors. Its components are (2.1) Environmental factors and (2.2) Personal factors. Environmental factors comprises 5 domains and Personal factors are not classified in the ICF. Note. From International classification of functioning disability, and health (p. 215) by WHO, 2001, Geneva: Author. Copyright 2001 by WHO. Adapted with permission in order to conserve space.
being coded (e.g., chapter 4 in the activities and participation component is the domain of “mobility”). The numbers after this but before the decimal point indicate position in the chapter. One or more numbers, called qualifiers, follow the decimal point and denote, for example, the severity of the problem at issue (e.g., 1 = mild; 2 = moderate; WHO, 2001).

The activities and participation component has 2 qualifiers, performance and capacity. Clear definition and interpretation of these qualifiers is critical in the context of disability athletics. The first qualifier following the decimal point is performance, which “. . . describes what an individual does in his or her current environment [i.e., in and around his or her usual home or community]” (WHO, 2001, p. 15). The second qualifier following the decimal point is capacity, which “. . . aims to indicate the highest probable level of functioning that a person may reach in a given domain at a given moment” (WHO, 2001, p. 15). It is important to emphasize that capacity is not prospective or predictive. It is assessed at a specified point in time and is not meant to indicate the highest probable level of functioning that a person could ever reach in the future. Capacity is assessed in a standardized environment (to neutralize the varying impact of different environments on the activity and/or participation of the individual) and thus reflects the environmentally-adjusted ability of the individual. “The gap between performance and capacity reflects the difference between the impacts of [the person’s] current [or usual] and uniform [or standardized] environments . . ” (WHO, 2001, p. 15).

To illustrate use of the codes, a person with a complete spinal cord lesion at T6, who cannot walk and therefore uses a wheelchair to move around, who has severe difficulty moving around his or her home environment (e.g., due to poorly maintained footpaths) but no difficulty moving on a firm, flat surface in a sports hall would receive the code a465.30 where “a” indicates the activities and participation component interpreted from the perspective of the individual, “4” indicates the domain of mobility, “65” indicates moving around using equipment (including a wheelchair), “3” indicates severe difficulty in the local or usual environment and “0” indicates no problems in a standardized environment.

Athletics Classification and ICF: A Comparative Analysis

A classification should use clearly defined language to state the purpose for which it has been written and what it classifies: its universe, scope, and unit of classification (Fleishman & Quaintance, 1984; WHO, 2001). This section relates ICF concepts to disability sports classification.

Universe

The universe of the ICF “. . . encompasses all aspects of human health and some health-relevant components of well being . . . [it] remains in the broad context of health and does not cover circumstances that are not health-related, such as those brought by socioeconomic factors” (WHO, 2001, p. 7). It is not only about individuals with disabilities, but all persons (WHO, 2001). The athletics classification
systems limit their collective universe to people with disabilities and to those aspects of human health that comprise the movements required in competitive athletic events. The smaller universe of disability athletics classification may therefore be conceptualized as a microcosm or subset of the universe of the ICF.

**Purpose**

The purpose for which a classification system is designed may vary from being broad and conceptual to being focussed and specific. The ICF is a “multi-purpose classification designed to serve various disciplines and various sectors” (WHO, 2001, p. 5). Two of its specific aims are to “provide a scientific basis for understanding and studying health and health-related states, outcomes, and determinants . . . [and] establish a common language for describing health and health-related states in order to improve communications between different users such as health care workers, researchers . . . and the public, including people with disabilities” (WHO, 2001, p. 5).

Each of the four athletics classification systems makes a statement about its purpose. While the statements vary, each specifies that it aims to facilitate fair competition in athletic events among eligible competitors (CP-ISRA, 2001; ISMWSF, 2000; ISOD, 1993). It is evident that in fulfilling this purpose, the current systems would contribute to, as well as draw upon, a scientific basis for understanding the functional states associated with health conditions, the stated purpose of the ICF.

**Scope**

The framework of the ICF organizes information into two parts (functioning and disability and contextual factors) and their respective components and domains (WHO, 2001). This framework is used to describe the universe of the ICF (i.e., all aspects of human health and some health relevant components), providing a structure for the meaningful organization of information (WHO, 2001). This structure also delimits the scope of the ICF.

The scope of the athletics classification systems is able to be fully described by a small number of the body and activity domains (expressly identified later in the section of this paper titled “Disability Athletics Systems Reinterpreted Using the ICF”), demonstrating that in relation to scope, the systems are closely linked conceptually but differ in their breadth of focus.

**Units**

Although they do not expressly identify units of classification, the four athletics systems each refer to the process of classifying athletes, thereby making athletes the units of classification. From a sociological perspective, it can be strongly argued that individuals should not be reduced to or characterized solely in terms of a classification (WHO, 2001). In deference to this principle, the “ICF classifies health and health-related states. The unit of classification is, therefore, categories within each domain . . . ICF does not classify people . . . ” (WHO, 2001, p. 8). The adoption of ICF categories as the units of classification in a unified athletics system would improve social sensitivity and strengthen links with the ICF.
The ICF as a Framework for a Unified Disability Athletics System

From a taxonomic perspective, basing the development of a unified disability athletics classification system more directly on the ICF has the potential to improve the utility of both systems and to advance understanding of functioning and disability associated with health conditions. A unified athletics classification system would benefit from close conceptual links with the more established and widely understood ICF. Moreover, by linking the development of the respective systems more closely, there is an opportunity for the disability athletics system to expand and develop specific domains within the ICF. For example, the development of a unified disability athletics classification system could expand and enhance relevant activities codes, specifically those for running (a4552), jumping (a4553), throwing (a4454), and wheelchair propulsion (a465). Empirical evidence suggests that such “fractionalizing” enhances the usefulness of primary categories in broader, more general systems (Fleishman & Quaintance, 1984).

There are other compelling reasons for basing disability athletics classification closely on the ICF. For example, the considerable resources and expertise at the disposal of the WHO facilitate development of the ICF; these resources are far in excess of the ones available for the development of sport classification systems. The ICF is reviewed regularly and is widely distributed, understood, and utilized. By 1993, 25,000 copies of the ICIDH had been distributed in 13 languages and it had been referenced in over 1,000 publications worldwide (WHO, 1993). Utilization of the language and structure of the ICF would greatly enhance the possibility of developing and articulating definitions and processes of classification that are understood and recognized by all stakeholders in the disability sport community.

McCann (1991) recognized the critical importance of using internationally accepted definitions in disability sport classification and advocated use of the ICIDH for this purpose. Although his recommendations have not been acted on to date, they remain relevant and, with the publication of the ICF, arguments based on the principles of taxonomy can be mounted that lend weight to his line of reasoning.

Disability Athletics Systems Reinterpreted Using ICF

The unified system envisaged would replace four of the systems currently used in disability athletics. To further inform the development of the taxonomic basis of this unified system, three of the four systems currently used in athletics—ISMWSF, CP-ISRA, and ISOD (amputee)—are analyzed, and the key concepts are restated in the lexicon of the ICF.

The fourth system, ISOD (les autres), is not analyzed. This is despite it being the only classification system of the 4 currently used that is not diagnostically based. Having been written to classify people with a broad range of impairments, it would appear to be a logical system on which to base a unified system. The ISOD (les autres) system is not analyzed because it lacks the detail and structure that could have made it useful as a framework for a more comprehensive unified system. For example, the les autres system offers only two possible classes for wheelchair-dependent athletes, in contrast to CP-ISRA and ISMWSF, which both have four wheelchair track classes. Clearly, using a system with only two classes for all wheelchair track athletes who would be eligible for a unified system is
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unrealistic. The unsuitability of the les autres system as a basis for a unified system is highlighted by the current IPC policy of taking athletes out of the les autres system and fitting them into the amputee or ISMWSF systems, rather than the reverse.

Examination of the CP-ISRA, ISMWSF, and ISOD (amputee) systems reveals that each attempts to achieve its purpose by three primary means: defining eligibility by impairment type, defining eligibility by minimal disability, and placing eligible athletes into classes. This section analyzes the current disability athletics systems under those headings.

Defining Eligibility by Impairment Type

Description of Current Systems. The ISMWSF defines eligibility by impairment type in their Memorandum of Association, which states that “The objects for which the Association is established are the relief of persons suffering from spinal cord injury or with a disability which can functionally be equated to a spinal cord injury . . .” (ISMWSF, 1995, p. 2). The CP-ISRA system is designed for people with “a diagnosis of nonprogressive brain damage with motor control dysfunction such as cerebral palsy, traumatic brain injury, stroke, or similar conditions” (CP-ISRA, 2001, Sect. 1.3). People with intellectual impairment without locomotor dysfunction are not eligible; neither are people with arthrogryposis and other conditions that do not result in motor dysfunction of a cerebral origin (CP-ISRA, 2001, Sect. 1.5). The ISOD (amputee) system exists for people with “. . . acquired amputations and dysmelia resembling acquired amputations” (ISOD, 1993, Sect. I, Chapt. 4.2.1) but not “dysmelia not resembling acquired amputations” (ISOD, 1993, Sect. I, Chapt. 4, Comment #1).

In each case, the framework is similar. People with certain types of impairments (of structure and/or function) are identified, and then additional qualifying remarks, which relate to diagnosis or activity limitations, are used to reduce or expand eligibility.

Analysis of Current Systems. The clarity and effectiveness of the eligibility criteria are compromised by the use of terms that are not standardized, such as “functionally be equated” (ISMWSF system), “similar conditions” (CP-ISRA system), and “resembling” (ISOD amputee system). For example, it is surely a matter of debate as to which disabilities can functionally be equated with spinal cord injury. Such potential areas for debate threaten the viability of a unified system. Additionally, several of the documents use terms such as disability, handicap, and impairment interchangeably or to mean different things.

The standardized language of the ICF would eliminate such ambiguities, reducing both the likelihood of confusion and the opportunity to challenge decisions based on the criteria. Moreover, the ICF codes could be used to help define eligibility. Codes b710-b799 (Neuromusculoskeletal and Movement-Related Functions), s110-s199 (Structures of the Nervous System), and s710-s799 (Structures Related to Movement) best describe the populations covered by the four current systems and would be the most appropriate starting point.

Defining Eligibility by Minimal Disability

In all systems, it is possible for an athlete to have an impairment type that satisfies eligibility criteria but to be ruled ineligible on the grounds that he or she does not meet other criteria, commonly called minimal disability criteria.
Philosophy of Minimal Disability. The CP-ISRA philosophy is succinct; it “seeks to provide sports opportunities for individuals . . . whose level of neurological impairment disadvantages them in training for, and competing in, sports” (CP-ISRA, 2001, Sect. 1.1). ISOD is more expansive, stating that their criteria aim to ensure that only athletes with impairments that prevent them from “participating on reasonably equal terms” with able-bodied athletes are included, thereby maintaining the credibility of the disability sport movement (ISOD, 1993, Sect. I, Chapt 4.1.1). Because some athletes competing in ISOD events have run 100 meters in less than 11 seconds, it may be necessary to either restate the philosophy or enforce it more rigorously. The ISMWSF has minimal disability criteria but does not explain the underlying rationale (ISMWSF, 2000). Given the differences between organizations, the differing philosophies underpinning the concept of minimal disability must be reevaluated before a unified system is developed.

Definition of Minimal Disability in Current Systems. To be accurate, ISMWSF defines minimal body function impairment, not minimal disability. Part of the ISMWSF classification process uses a “physical examination to establish a muscle chart” (ISMWSF, 2000, p. 5). The muscle chart is used to grade the strength of 54 muscle groups on a scale of 0 to 5, with 0 being total lack of voluntary contraction and 5 being a normal contraction. Maximum points for the lower limbs is 80 (40 points each), and an athlete who scores 70 points or less is eligible (ISMWSF, 2000, T54 and F58 profiles).

The ISOD (amputee) system defines minimal body structure impairment, stating “Minimal handicap [impairment] . . . [is] amputation through or above the wrist joint” (ISOD, 1993, Sect. I, Chapt. 4.2.3). No lower limb criteria are identified.

CP-ISRA uses both minimal body function impairment and minimal activity limitation in their definition: “If an abnormality can only be detected by a detailed neurological examination and impairment of function is not clearly evident during classification and does not obviously impact on sports performance, then the athlete is not eligible for competition” (CP-ISRA, 2001, Sect. 1.3).

The key feature of the criteria discussed in this section is that each set is written for a single, relatively homogeneous impairment group. These criteria do not define activity limitations with respect to specific athletic events or types of activities. Instead, the criteria focus primarily on the results of assessment of body structure or function and include qualifying remarks.

Analysis of Minimal Disability in Current Systems. Development of a unified classification system that is specific for disability athletics must consider that in the ICF, impairment and activity limitation are not synonymous and cannot be used interchangeably. A given impairment may result in an athlete experiencing considerable activity limitation in certain athletic events but negligible activity limitation in other events. For example, the extent of activity limitation experienced by an athlete with no fingers will be large in throwing events and negligible in long distance running.

Development of a unified system will require the relevant authorities to take account of this and develop a philosophy of minimal activity limitation that is couched in the terms of the ICF and that can be used to define what constitutes genuine or legitimate minimal activity limitation in each of the athletic disciplines (e.g., wheelchair racing, running, jumps, throws). Where the performance determinants of events within athletic disciplines vary, logical subdivisions of these disciplines should also be considered (e.g., divide running into sprints and distance because of the specific requirements of the crouch start for sprints).
The philosophical statement should be supported by clear and unambiguous criteria for minimal activity limitation. In regard to these criteria, the ICF Activity codes for running (a4552), jumping (a4553), throwing (a4454), and wheelchair propulsion (a465) could be used. However, further expansion and development of the qualifying codes described in the activity dimension would be essential.

Placing Eligible Athletes Into Classes

**Description of Current Systems.** Having described eligible athletes in terms of the type and extent of impairment, each of the classification systems assigns athletes to classes for the purpose of facilitating fair competition. A brief summary of these systems follows.

ISMWSF uses a muscle chart of the athlete (described previously) together with observation of the athlete performing a series of generic and sport-specific tests of activity limitation to place athletes into one of four classes for track events (T51-54) and/or one of eight classes for field events (F51-F58; ISMWSF, 2000).

CP-ISRA uses a neurological examination, including the Ashworth Scale (Ashworth, 1964), together with observation of the athlete performing a series of generic and sport-specific tests of activity limitation to place athletes in one of eight classes (C1-8). This system is used for several CP-ISRA sports (CP-ISRA, 2001).

The ISOD (amputee) system takes account of various aspects of amputation—the limb(s) affected (upper or lower), how many limbs have been affected, and how much of the limb has been amputated (e.g., above knee, below elbow)—in order to place people into classes for fair competition (ISOD, 1993). This system is used for several ISOD sports.

Implicit in each of the systems is a degree of flexibility that allows classifiers to assess and control for a range of factors additional to those described (e.g., how old an athlete is, how well trained an athlete is). The nature of the impairments assessed in each of the systems means that this flexibility is exercised more in the CP-ISRA and ISMWSF systems (which also make greater use of assessment of activity limitation) than in the ISOD (amputee) system.

**Analysis of Current Systems.** In general, the approach of the ISMWSF, CP-ISRA, and ISOD (amputee) systems is quite clear and logical. When eligibility of an athlete for a system of classification is defined in terms of the type and magnitude of impairment (of body structure and/or function), then the methods used for the assessment of the impairment and its impact on activity will be similar, allowing comparison of results and providing a sound basis for grouping athletes into classes.

However, these systems do not control for the extent of impairment of an athlete. This phrase is taxonomically inconsistent with the ICF, being predicated on the outdated notion that activity limitation is caused by impairment. The phrase implies that by measuring impairment, the activity limitation experienced by a person can be predicted. The ICF clearly illustrates that the impairment and activity dimensions are interdependent (see Figure 2) and that impairment does not cause activity limitation (WHO, 2001).

The clearly defined lexicon of the ICF removes the ambiguity previously associated with the term impairment, using it only to describe limitations in the domains of body structure or body function. Activity limitations (not impairments) refer to difficulties experienced by a whole person (see definitions in the Figure 2...
caption); the term whole person impairment is not valid in the ICF classification system. While a range of methods can be used to quantify the impairment of discrete structures or functions, it is not a simple matter of converting an amount of impairment into an amount of activity limitation. The process of understanding how much a given quantity of impairment will affect the activity of a whole person must begin by defining the activity.

To illustrate, Person A and Person B may both have spinal cord lesions that paralyze 50% of their musculature, resulting in the same total score using the ISMWSF muscle chart. Quantitatively, these persons could be said to have the same extent of impairment. However, if the distribution of the paralyzed muscles is spread over the upper and lower body (including the small muscles of the hand) in Person A and restricted solely to the lower body in Person B, then it is likely Person A will be less impaired in the activity of walking/running, but more impaired in the activity of throwing a ball, than Person B. In this case, a correct restatement of the comparison of Persons A and B is that Person A experiences less activity limitation in walking and greater activity limitation in throwing a ball, than Person B.

As identified in the preceding analysis, the current disability athletics systems take account of both observable activity limitation and assessment of impairment. If the current classification processes are interpreted in light of the ICF framework, then estimation of the extent of activity limitation resulting from impairment should be the definitive role of a unified disability athletics system. Assessment of impairment alone is not sufficient because the effects of impairment only make sense when interpreted in light of a specific activity. Assessment of activity limitation alone is not sufficient because there are many factors other than impairment that influence activity limitation.

Impairment is one of a wide range of factors that will impact upon observed performance of athletic skills. Personal factors that will impact upon athletic performance include age, gender, anthropometry, physiology, psychological makeup, training, and experience; environmental factors include availability, quality and accessibility of local sports facilities, quality of coaching, available funding, and local climate. An estimate of the effects of impairment on the execution of a sports skill is improved by assessing the extent to which each of these other factors affect sports skill execution. Four principal areas need to be assessed: (a) body function and structure impairment (e.g., reflexes, spasticity, muscle power); (b) activity limitations in generic tasks (i.e., novel motor tasks that are unlikely to have been practiced by the athlete); (c) activity limitations in discipline-specific tasks (i.e., tasks required by their sport that demonstrate the influence of practice); and (d) factors other than impairment, known to influence the activity limitations observed (e.g., personal and environmental factors). Assessment of areas (a) and (b) establishes an initial impression of the relationship between impairment (of body structure/function) and activity limitation. Results from assessment of areas (b) and (c) can be compared to assist the classifier to evaluate the level of training of an athlete and control for it (i.e., so that level of training does not influence the final classification). The factors assessed in area (d) are assessed so that their effects on the observed activity limitation may be taken into account and controlled for.

McCann (1984, 1991, 1993, 1994) has written extensively about the issue of assessment in classification and is credited with the concept of performance potential, which represents “a latent excellence or ability that may or may not be developed” (McCann, 1994, p. 113). Vanlandewijck and Chappel (1996) refer to
measurement of performance potential as the cornerstone of classification, arguing that an “acceptable classification system would allow the definition and measurement of performance potential and would not be influenced by how the athlete uses this potential” (p. 73).

The term *extent of activity limitation resulting from impairment* is an improvement on the term *performance potential* as it uses the language of the ICF, thereby enhancing the clarity of the concept. It also extends the performance potential concept, emphasizing that identification and assessment of the relationship between impairment and observable activity limitation should be the definitive role of a unified disability athletics system.

### Defining Disability Athletics Classification and its Purpose

#### Proposed Definition of Classification for a Unified System

Fleishman and Quaintance (1984) define classification as the “ordering or arrangement of units into classes on the basis of their relationships, based on observable or inferred properties” (p. 22). The preceding analyses of three of the current athletics systems make it possible to adapt the statement by Fleishman and Quaintance (1984), allowing the following definition of disability athletics classification to be proposed:

Disability athletics classification is the ordering of specified impairments of structure and function into classes based on the extent to which they cause an athlete to experience activity limitations in identified subdisciplines of athletics.

In relation to this definition, it should be noted that “specified impairments of structure and/or function” are the units of classification (not the athletes). These units are likely to come from the codes (b710-b799), (s110-s199), and (s710-s799). Also, the phrase “. . . into classes based on the extent to which they cause an athlete to experience activity limitations . . .” indicates that the units of classification are grouped into classes according to the extent of activity limitation they cause. This is the means by which the proposed system attempts to control for the extent of activity limitation experienced by an athlete as a result of his or her impairment. Finally, the words “. . . in identified subdisciplines of athletics” take account of the fact that a given impairment may result in an athlete experiencing a small activity limitation in some athletic subdisciplines and a large activity limitation in others.

#### Proposed Statement of Purpose for a Unified Classification System

The preceding analyses of three of the current athletics classifications also allow a statement regarding the purpose of classification to be articulated more definitively and informatively, as follows:

The purpose of disability athletics classification is to facilitate fair competition in athletic events among eligible competitors by minimizing the influence of specified impairments of structure and/or function on the results of athletic competition.
In relation to this statement, the following should be noted. The term *fair competition* means competition that is decided on the same basis as able-bodied athletics. That is, it should be decided upon through natural anthropometric, physiological, and psychological attributes and enhancement of those attributes by legitimate means (training, diet, recovery etc.), event technique, and legal technical aids (strapping and/or prosthetics, equipment design etc.). Athletes should not be precluded from potential success due solely to the extent of the activity limitation caused by their impairment. This concept of fairness accords closely with notions of fairness expressed in the three current systems (CP-ISRA, 2001; ISMWSF, 2000; ISOD, 1993).

For the proposed system to meet the criteria for fairness described in this section, taxonomic principles dictate that classifications should describe the structure and relationships of the constituent units in relation to each other (Fleishman & Quaintance, 1984). In other words, the taxonomic integrity and intellectual credibility of a unified system of classification depend on establishing a basis for comparing the extent of activity limitation caused by the range of impairments that are included in the system (e.g., brain injury, amputation, spinal cord injury).

In recent studies, Daly and Vanlandewijck (1999) and Wu and Williams (1999) proposed criteria and methods for evaluating the fairness of the swimming classification system that were based on statistical analysis of race performances. For example, a system was deemed to facilitate fair competition if (a) swimmers in higher classes outperform those in lower ones; (b) the speed of world records shows a predictable decrease with decreasing functional class; (c) elite swimmers in the same class demonstrate similar performances; and (d) elite swimmers with a range of physical impairments have an equal opportunity for success (Daly & Vanlandewijck, 1999; Wu & Williams, 1999). These methods and criteria could be employed to evaluate the proposed disability athletics system following implementation.

However, it should be recognized that these methods have limitations and must be interpreted correctly. For example, it is highly probable that a system that classified the personal best race times of athletes (rather than impairments) would also meet these criteria. A performance banding approach such as this, however, would not accord with the notions of fairness expressed in the current disability athletics systems (CP-ISRA, 2001; ISMWSF, 2000; ISOD, 1993) or the criteria for fair competition proposed in this paper. Therefore, while analysis of performance outcomes is one useful means of evaluating aspects of fairness, there is also a critical need for research that attempts to evaluate the scientific foundations of sports classification, including establishment of a basis for comparing athletes with differing impairments.

Some other elements of the proposed statement of purpose require further explanation. The phrase “...by minimizing the influence...” infers that classification does not eliminate the influence of the impairments, only minimizes it. That is, not all athletes in a class will experience exactly the same extent of activity limitation as a result of their impairment. Classes must span a sufficiently large range of activity limitation to ensure that enough people are eligible for the classes to hold viable competitions. The range of activity limitation must be sufficiently small to ensure that within any one class, the athlete with the greatest extent of activity limitation is not unduly disadvantaged when compared with the athlete with the least extent. These criteria must be balanced while also addressing the necessary and laudable task of keeping the number of classes to a minimum.
Finally, in the statement of purpose, “. . . specified impairments of structure and/or function” are the units of classification. Only impairments specified in the eligibility criteria should be taken into account in the classification process. Impairments that may compromise athletic performance or preparation but which would not be taken into account include (but are not limited to) impairment of mental functions, sensory functions (including vestibular, hearing, seeing, proprioceptive, and pain-sensing functions), and cardiovascular functions.

It should be acknowledged that one of the advantages of the current CP-ISRA, ISMWSF, and ISOD (amputee) systems, and a disadvantage of the proposed unified system is that because of the diagnostic homogeneity within those systems, the associated impairments that are not specifically classified are controlled for naturally. For example, many athletes with SCI have autonomic nervous system impairment that results in problems with thermoregulation. Therefore, if only people with SCI compete, problems that an athlete experiences as a result of poor thermoregulation are less likely to determine the outcome of an event. This element of control is lost in a unified system.

The proposed definition of classification and the statement of its purpose provide a sound basis for the development of a unified athletics classification system. The content of this paper may also be able to be adapted for application in other sport-specific disability classifications (e.g., cycling, swimming).

**Conclusion**

This paper has proposed a conceptual structure to guide the development of a unified classification system that would replace four of the systems currently used in disability athletics — CP-ISRA, ISMWSF, ISOD (amputee), and ISOD (les autres). The scientific justification for this paper was established through a review of the literature. The structure proposed is based on analysis of the current systems and on application of current taxonomic theory, including the language and structure of the ICF.

**References**


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1In 1980, the WHO first published International Classification of Impairments, Disabilities, and Handicaps (ICIDH). In 1993, the WHO began a revision of the ICIDH and published several drafts using the acronym ICIDH-2. In May 2001, the revised classification was endorsed by the World Health Assembly and renamed the International Classification of Functioning, Disability, and Health, to be known as ICF (Resolution WHA54.21). The ICF was published later in 2001.