

Further Evidence to Change the Medical Classification System of The National Wheelchair Basketball Association

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A number of researchers have long questioned systems used for classifying athletes with disabilities. Wheelchair basketball players have gained much attention from researchers. Despite this, no change to the NWBA classification system has been made since it was first adopted in 1984. This study investigated the NWBA classification system. At two summer basketball camps, 46 players were tested to assess player sprint performance and stratification under the NWBA medical classification system. The group consisted of Class 1, 2, and 3 players. Electronic timing gates were used to collect 20 meter sprint-times. Results indicate that Class 1 players were significantly slower compared to Class 2 and 3 players ($p < .05$) with no difference between Class 2 and 3. The results of this study support a change to this system.

Classification of athletes with disabilities in most competitions can be a difficult task, especially those that use both a medical and/or functional system. The classification process can best be described as a form of medical and/or functional evaluation for the purpose of placing athletes with disabilities in the most appropriate level of competition. Several authors have determined its purpose to be a way of assuring equitable competition (McCann, 1980; Richter, Adams-Mushett,

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Ferrara, & McCann, 1992; Sherrill, Adams-Mushett, & Jones, 1986). Currently, it is understood that there are two categories of classification that utilize two different systems of evaluation: one medical and the other functional. Medical classification is based on the athlete's physical condition or nature of disability (Davis & Ferrara, 1996). Functional classification focuses on the athlete's ability to perform specific sport skills. Two athletes having the same medical classification may have a different functional classification as a result of experience and appropriate equipment. This problem is faced by the sport of wheelchair basketball in the United States and the National Wheelchair Basketball Association (NWBA).

The NWBA has three classes: Class 1, T7 injuries and above; Class 2, T8 to L2 and some amputees (bi-lateral hip disarticulation); and Class 3, L3 and below and all other amputees. Wheelchair Sports USA, formerly the National Wheelchair Athletic Association, uses eight different classes; two of these classes are for swimming events only. The International Wheelchair Basketball Federation (IWBF) has a classification system made up of eight classes, with half of these classes being for those "in-between" cases. By using a classification system, each player is allocated a number of points based on their classification. Under the NWBA guidelines a Class 1 athlete is allocated 1 point, a Class 2 athlete gets 2 points, and a Class 3 athlete receives 3 points. Under these guidelines, a team can be made up of any combination of players that does not exceed a total of 12 player points on the court at one time. In this way, individuals of varying degrees of disability can compete on the same team and in the same competition. A long-standing argument, particularly in basketball, is that this classification system is unnecessarily complicated and that fewer classes may be appropriate (Brasile, 1990a, 1990b; Vanlandewijck, Spaepen, & Lysens, 1994, 1995). Further, a classification system should adequately reflect players' abilities and fairly distinguish between different classes of athletes. Consequently, this classification system has been under investigation for more than 10 years. Researchers have questioned the system's sensitivity for athlete selection and its ability to discern individual athletic performance (Brasile, 1990a, 1990b; Vanlandewijck et al., 1995). Brasile (1990a) has long advocated a reduction of classes in wheelchair basketball in the United States. Equipment advances have also contributed to this discussion for the sport of basketball and other sports involving wheelchair propulsion.

There have been many wheelchair advances since the IWBF and NWBA classification systems were developed and approved in 1982 and 1984, respectively. Similar to a track athlete's shoes or a cyclist's bike, a wheelchair is a piece of equipment used in competition. As such, it has evolved with the sport to accommodate players and enhance their playing skills (Madorsky & Curtis, 1984). Sport wheelchairs that are different from traditional wheelchairs bridge the gap between players of different disabilities. With experience, athletes learn how to use and customize their wheelchairs to enhance their abilities, the same way a cyclist may alter crank length or opt for a smaller diameter front wheel. McCann (1981) identified a number of wheelchair design and use issues to bridge this gap. Those with poor trunk control may angle the back of the seat downward so that they are in a posture with the trunk resting against the upper thighs for support. Altering the seat design can also afford longer hand to rim contact time, which is the key component of wheelchair propulsion. As early as 1972, certain wheelchairs had different rear axle locations allowing for various seat inclinations. As a result of design changes, times for the marathon have decreased by a substantial 10 minutes

over the last decade. Consequently, the classification systems, conceived when athletes competed in traditional wheelchairs, may no longer be appropriate for today's competition. With these design advances, athletes in each class may not perform as differently from each other as they once did.

A number of researchers have evaluated various classification systems from other sports and concluded that a restructuring is warranted. Vanlandewijck et al. (1994) investigated wheelchair propulsion technique used in track and found that maximal aerobic capacity and power output differed significantly between Groups 1 and 2, and Groups 1 and 3. Brasile (1984, 1988, 1990b) found Class 2 and 3 players, based on the NWBA classification system, scored similarly on skill level proficiency scores (e.g., tasks such as sprint, pass, and shoot). Class 1 players did not perform as well as their counterparts when tested for skill proficiency and were significantly different from Class 2 and 3 players when assessed for psychosocial traits related to participation.

The purpose of this investigation was to determine if wheelchair athlete performance could further support a reduction in the classification classes for wheelchair basketball within the United States. Data were collected over 2 years during summer training camps from NWBA registered players. Their performances over a 20-meter sprint, a task routinely used to test ability (Brasile, 1984), was measured and evaluated. Further, the camp director had asked for this task to be evaluated. The sprint task was not intended to be the sole determinant for classification restructuring, but rather it was used to contribute to the current evidence.

Method

Participants

The participant group consisted of 46 men tested during two NWBA summer basketball camps held in consecutive years. All participants voluntarily participated in the research and signed informed consent documents in accordance with Institutional Review Board guidelines. A number of participants were involved in the camps both years. In these cases, only their best trials were used for the statistical analysis. Participant descriptive data are as follows: Class 1, $n = 11$, height = 179.9 cm, mass = 79.42 kg; Class 2, $n = 18$, height = 174.3 cm, mass = 72.72 kg; Class 3, $n = 17$, height = 175.6 cm, mass = 77.65 kg.

Procedures

Participants were positioned at the starting line facing away from the finish line. They were asked to pivot their wheelchairs 180° and sprint as fast as possible over a 20-meter distance. The direction of the initial pivot was self-selected by the participants. The axle of the rear wheel was aligned with the start line of the 20 meter course. Participants positioned their bodies to be ready to react as quickly as possible to a siren that indicated the start of the test. The time between "Get ready" and the siren was randomized to eliminate preparatory strategies that would stem from being able to anticipate the siren. Electronic timing gates (Fitness Technologies, Adelaide, Australia) were positioned to record times at 1, 5, and 20-meter intervals. The timing gates interfaced with a personal computer running Kinematic Measurement

System (Innervations, Indiana, USA). Since this was a regular task performed by the players, there were no familiarization trials. Participants performed these trials using their own wheelchair of which some had a fifth rear wheel. Data were recorded for three sprints and the best time was used for analysis.

Statistical Analysis

The data were subjected to a two-way analysis of variance (ANOVA) to assess differences between 1, 5, and 20-meter sprint times and velocities for each of the three NWBA classification levels. A Tukey's post-hoc analysis was used to determine where between group differences occurred. An alpha level of $p < .05$ was used as the criterion for statistically significant difference between groups.

Levene's test of homogeneity was used to test for equal variances across groups. This test ensures that an ANOVA can be appropriately applied to the data. An effect size was calculated and compared to Cohen's convention for effect sizes for an ANOVA test.

Results

There were between group differences for both time and velocity over the entire 20-meter distance ($F = 4.696$, $p < .05$ and $F = 3.885$, $p < .05$, respectively). A Tukey's post-hoc analysis determined that Class 1 was significantly different from Class 2 and 3 for both time ($p = .019$ and $p = .028$, respectively) and velocity ($p = .038$ and $p = .047$, respectively). The results indicated that over the entire distance of 20 meters, Class 1 players (lower functioning) were slower than Class 2 and 3 players. Statistically, all groups performed equally for both time and velocity over the shorter 1 and 5 meter intervals. Results are shown in Figure 1.

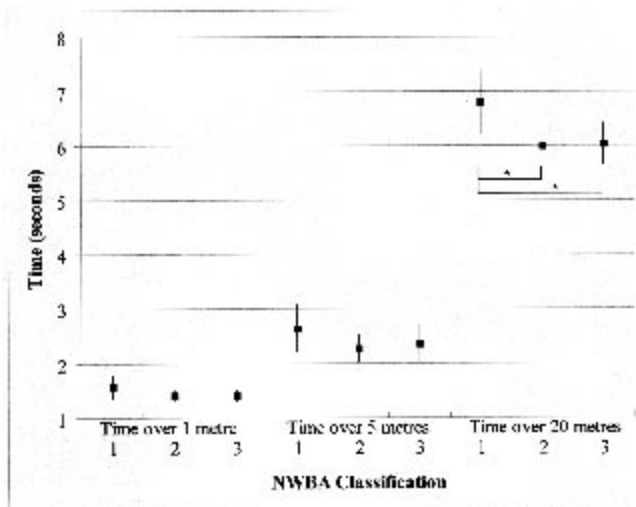


Figure 1 — Times over 1, 5, and 20 meters, grouped according to NWBA classification level. Means are plotted with $\pm 95\%$ confidence intervals. Significance indicated by *.

Levene's test of homogeneity indicated that the groups had equal variances for both time and velocity over 20 meters (Levene statistic = .387 and .202, $p = .682$ and $.818$, respectively). A large effect size, according to Cohen's convention for effect size for ANOVAs, was present for both time and velocity over 20 meters (effect sizes = $.45$ and $.41$, respectively).

Discussion

Since its inception in 1984, the NWBA classification system has changed very little despite advances in wheelchair design and technology. Even before the 1984 classification system was introduced, the effect of wheelchair design and corresponding technique changes were considered a potential equalizer of paraplegic athletes of different levels (McCann, 1981). While wheelchair design was not addressed in this investigation, it should be considered in future research.

A number of researchers have suggested, based on experimental findings, that the number of classes in the NWBA should be reduced from three to two (Brasile, 1990a, 1990b; Vanlandewijck et al., 1994, 1995). This reduction in classes would allow for simpler administration of the game and possibly more accurately reflect the different skill levels of the players. NWBA players were tested to add empirical data that supports a change to the NWBA classification system. Results of a 20-meter sprint support previous research findings that the current three-class system may not accurately reflect the skill levels of the players (Brasile, 1990a, 1990b; Vanlandewijck et al., 1994, 1995). Since no differences were found between Class 2 and 3 participants, it is suggested that these classes be combined to form one class, thus better serving the game of wheelchair basketball. This suggestion has been made previously by others; however, it has not been addressed in nearly 10 years (Brasile, 1990a, 1990b; Vanlandewijck et al., 1994, 1995). An alternative solution to the problem of the NWBA medical classification system not accurately representing players' abilities would be for the NWBA to adopt a functional classification system as does the IWBF. This would provide an advantage of not having to reclassify the athlete when competing outside of NWBA competition (e.g., international competition such as Pan American Games). Reclassifying an athlete changes the composition of the team and can affect playing time. For example, should a Class 2 NWBA player be reclassified to a Class 1 IWBF, they might see less court time due to the international player point rule of 14 points allowed on the floor. Coaches might be more inclined to field a team with players of higher classification and function. Further, moving to a functional classification might make for easier comparisons to other teams and players from other countries. The present study supports previous findings and in light of this and previous evidence, calls for this issue to be addressed. Results from this current investigation are used only to support previous research findings. It is accepted that inferences based on research findings are more valid when tests are validated in the context they are used and when based on findings from more than one test (Yun & Ulrich, 2002). The use of a 180° pivot followed by a 20-meter sprint is considered valid in this context as it allows for comparison with other studies and is a test used routinely by the camp directors from where participants were recruited. However, the use of one test can be considered a limitation of this study.

The results presented here indicate that Class 1 players are significantly slower than both Class 2 and 3 players. Brasile (1984) also found Class 2 and 3 players performed significantly better than Class 1 players in a standard 20-meter sprint without a starting pivot. That test is used as part of a common battery of tests to assess performance. This suggests that although there is a medical difference between Class 2 and 3 players when classified according to the NWBA classification system, there seems to be no functional difference between the two groups of players in executing a 180° pivot followed by a 20-meter sprint. These findings support those of Brasile (1990a) who tested 79 male players at a national team tryout camp for the NWBA/Paralyzed Veterans of America. His study concluded that not only were Class 1 players significantly different from Classes 2 and 3 in the 20-meter sprint, but they were also significantly different from Classes 2 and 3 in a 1-minute shooting test (dominant hand).

In Brasile (1990b), a group of 91 male players from NWBA teams were tested across a series of seven skill and performance tests. Only in the pass for accuracy test were significant differences found between classification levels. This significant difference was attributed to an advantage afforded to players based upon the “tester perceived weakness” due to the players’ disability. In this test only, Class 1 players were given a 5-foot advantage over their Class 2 and 3 counterparts. During the same study, a second group of players, 23 male NWBA players attending a tryout camp, were tested across the same seven test items. No significant differences were observed between players of different classes. Although this group of players was classified according to a four-class system, it is worth examining the results as they demonstrate that by classifying players into more rather than fewer classes, differences are less likely to be obvious between classes. In addition, the total number of participants in this group was quite low, and different statistical results may have been found with a larger number of participants. This particular study, by using a battery of seven tests, is a better way to test a functional classification system like that of the IWBF. Results and conclusions from this study are still worth discussing when evaluating the medical classification system of the NWBA.

Because of the nature of the task performed in the current study, it is not surprising that differences were found only at the longer distance (i.e., 20 meter). Initially, participants were required to pivot their chairs and begin sprinting as quickly as possible. This task alone is functionally very different from a sprint only and may represent differences in pivoting and starting capacity than the sprint alone. The focus of the present investigation, however, was sprinting and so effects of pivoting and starting capacity were not specifically addressed.

A number of studies lend evidence to support that players with lower-level impairments may not be as functionally different from each other as they are from players with higher-level impairments. When tested for psychosocial factors related to participation, Class 1 players were different from Class 2 and 3 players (Brasile, 1988). Specifically, Class 1 athletes report higher enjoyment levels than Class 2 and 3 athletes. Although not related to performance, this result further highlights the disparities in the classification system used by the NWBA. Vanlandewijck et al. (1994) similarly found that wheelchair basketball athletes classified as Group 1 according to the International Stoke Mandeville Wheelchair Sports Federation guidelines were significantly different to Groups 2 and 3. Specifically, maximal aerobic capacity and power output were lower in Group 1 players compared to Groups 2 and 3.

Evidence abounds in the literature to support the notion that current guidelines for classifying players for basketball competition may be outdated. Based on cumulative results, higher-level injured players can be considered to be different from lower-level injured players. The current guidelines used to discriminate between lower-level injured players typically do not allow for placement of players into groups that are different from each other.

Previous researchers and other stakeholders in wheelchair basketball organizations suggest that a less complicated two-group classification system should be used. Results from this research support this suggestion. Brasile's (1990a) suggestion of incorporating Class 2 and 3 players into one group and adopting an 8-point system would allow for more fair and equal participation of all players, regardless of their classification. Alternatively, classification of players might be better served by adopting a functional classification system such as the IWBA. The advantages of a two-class system are as follows.

In a two-class system, Class 2 and 3 players would be combined, and Class 1 players would not change their classification. For some competitions considered more recreational, e.g., local and community, a three-class system might be appropriate. Potentially, it offers a friendlier setting and encourages more player participation; newcomers in particular might feel more comfortable playing in a class that is more obviously matched to their own medical classification. However, at higher levels of competition, e.g., college and national, players should be classified into two classes. A two-class system offers several benefits to help streamline the process of classification and implementation of the games.

Two classes of players would allow for easier substitution of players onto and off the court. Currently, coaches must manage a substitution regime by maintaining 12 points on the court at one time. With a two-class system, total court value could be reduced to 8 points, thus allowing the coach to play more Class 1 players. A two-class system might also help to motivate the players to strive for higher levels of competition.

Players wishing to compete at higher levels of competition must become more skillful. A two-class system would encourage and foster this higher level of competition. A similar competition model is used by other sports, whereby players are classified into fewer groups. They therefore compete in a larger pool of athletes and must compete more skillfully at higher levels of competition. Such a system might also allow for increased playing times for athletes currently classified as Class 1. As a consequence of increased court time, these athletes have a better opportunity to advance their playing skills (Brasile, 1990a). A two-class system would help streamline the classification process, help coaches with court management issues during play, create a motivation factor for players to move onto higher levels of competition, and increase opportunities for lower classes to be involved.

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