Sports classification and athletes with intellectual disabilities: Measuring health status using a questionnaire based on the international classification of functioning, disability and health

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"Sports Classification and Athletes with Intellectual Disabilities: Measuring Health Status Using a Questionnaire Based on the International Classification of Functioning, Disability and Health"

Abstract

Most people with intellectual disabilities (ID) have co-morbid health conditions which will impact upon optimisation of sporting performance. Classification is used in Paralympic events to ensure that those with similar levels of functional ability compete fairly against each other. An evidence-based approach needs to be developed for athletes with ID to be classified in relation to their overall functional capacity into competition groups of similar ability. This research builds on previous work using the taxonomy of The International Classification of Functioning, Disability and Health (ICF) to group athletes with ID into comparable competition groups as an approach to Paralympic classification. Three groups of athletes Virtus, Special Olympics and Down Syndrome, are compared using the ICF questionnaire indicating functional health status in relation to sporting performance. The questionnaire was found to discriminate between athletes with Down Syndrome and other athletes and an approach to using a cut-off score to develop competition classes is explored.

Keywords: words; Intellectual impairment, classification, Down Syndrome, Paralympics

Introduction

The current classification of intellectual disability

Intellectual disabilities (ID) are currently classified as a neurodevelopmental health condition under the International Classification of Diseases and Related Health Problems, Eleventh Revision (ICD-11) [1]. ICD-11 diagnostic criteria for ID, common with other taxonomies, refer to three specific elements 1) significant impairment in intellectual functioning, 2) significant impairment in adaptive behaviour and that 3) these impairments should have occurred within the developmental period. Assessment of ID usually involves an assessment of IQ and adaptive behaviour using standardised, age and culturally appropriate measures, and taking a development history evidencing age of onset.

The aetiology of ID is varied including genetic disorders, and environmental trauma prepartum, postpartum and during birth. For many the exact aetiology will not be known, especially for those with milder forms of ID (Hatton & Emerson, 2015). However, whatever the initial cause of the ID, damage is not usually confined to the nervous system affecting intellectual functioning, but is likely to impact on other health systems, such as muscular, skeletal, cardiovascular, and respiratory systems. That this damage occurs during the person's developmental period is highly significant as it has a compacting and iterative impact on the individual's ability to compensate for these deficits and leads to increasing developmental delay, especially if adaptive interventions are not available. As

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[1] ICD 11 also introduces a new term 'Disorder of Intellectual Development' for Intellectual Disability. As the terminology of Intellectual Disability (ID) is still the prevalent term in common usage this paper will refer to Intellectual Disability.

a result, multi-morbidity levels are extremely high in this population. A recent large-cohort study on the Scottish population of people with ID found that the average number of health conditions in addition to ID for each person was 11 and over 98.7% of the cohort experienced two or more physical health and/or sensory issues (Kinnear et al., 2018). Some of these health conditions will be directly related to the primary causation of ID, and some will be a secondary consequence of having ID, relating to life circumstances such as economic dependency and impoverished life opportunities. The functional capacity of a person with ID will result from the overall accumulation and impact of these underlying health impairments.

Sports classification and athletes with intellectual disabilities

High performing athletes with ID currently compete through Virtus: World Intellectual Impairment Sport which is an International Organisation of Sports for the Disabled (IOSD), one of four such independent organisations recognised by the International Paralympics Committee (IPC). ID athletes also compete in events organised by International Sports Federations, and within the Paralympics in swimming, athletics and table tennis. Virtus provides a central eligibility system which verifies that the athlete meets the diagnostic criteria to compete within the Paralympic category of Intellectual Impairment, which subsumes the health condition of intellectual disabilities. Currently, athletes with ID all compete in one class in the Paralympics despite the wide range of severity of this impairment leading to functional differences affecting sports performance.

Having only one competition class has a specific impact on athletes with Down Syndrome (DS) who, because of their genetic phenotype, have additional health conditions (e.g., muscular, respiratory, skeletal), which increases their functional impairment resulting in being unable to compete fairly with other athletes who also have

ID from other causes (Burns & Lemmey, 2021). For example, to date no athlete with DS has competed in the Paralympics since re-inclusion in 2012 despite being eligible through their ID and the research of Lemmey, et al., (2021) showed a clear distinction between athletes with DS and those athletes with ID but not DS competing in Virtus. The question then arises of how athletes with ID can be classified into higher and lower functioning competition groups who can then compete fairly against each other. Developing a competition class based on diagnosis alone, e.g., DS, would be in contradiction of the IPC classification code, which is based on levels of functional impairment, not diagnosis (IPC, 2015). It would also not solve the problems for the many athletes who do not have an identifiable causation of their ID but are more functionally impaired (Van Biesen, Burns, Mactavish, Van de Vliet, & Vanlandewijck, 2021). In addition, opening diagnostic classes would set a precedent for other classes from the many other syndromes associated with ID (e.g., Williams Syndrome, Fragile X, Foetal Alcohol Syndrome etc.) which would not be practical. Another approach suggested has been to use IQ cut offs as used with the previous ICD taxonomies to define, mild, moderate, and severe ID. However, it has been shown that there is not a consistent correlation between IQ and sports performance in this population (Van Biesen, et al., 2012; Van Biesen, et al., 2014; Van Biesen, et al., 2016). Further research has also shown that health status in relation to co-morbidity is a co-variant suggesting that those athletes with lower IQ tend to be more physically compromised, and it is the physical health problems, and not IQ, that limit functional capacity which in turn impacts negatively on sports performance (Gilderthorp et al., 2018). Within the Special Olympics a different approach is taken called ‘divisioning’, which allows athletes to compete who are similarly matched on age, sex and performance. However, this is not compliant with the IPC classification code, (IPC, 2015) as performance is not considered due to the impact of training and nor is age considered as a variable on which to base classification. A more productive approach to this issue has been to take the functional approach suggested by Tweedy and consider the overall functional capacity of the athlete as defined by the ICF framework (Tweedy, 2002). This approach fulfils the suggested criteria which should underpin sports classification, of being based on a clear taxonomic theory and being evidence based. It also fits with conceptual approach to sport ID classification, approved by the IPC and set out in Van Biesen, et al., (2021). Work first started on this approach by Gildethorp et al., (2018) using the ICF Checklist V2.1a (World Health Organisation, 2003), which is a brief measure indicating the presence or not of health conditions and their impacts on functioning. This study examined the relationship between IQ, additional impairments and sporting performance. DS as a comparative diagnostic group was chosen as in nearly all instances these athletes will have the underlying health condition, ID, and additional health conditions which will impact on performance hence the group provides a good test of classification approaches. Other groups could be chosen such as autism, but whilst common it is not always the case that athletes with this condition have both ID and additional health conditions. Comparing high performing and moderately performing athletes with ID and athletes with DS, they found that overall functional capacity predicted sporting performance, not IQ or diagnosis. Such results suggested that using the ICF and its tools as the conceptual approach to classification in ID sport had merit, but that the ICF Checklist lacked the measurement sensitivity and specificity required in this context.

A further study was carried out to examine the efficacy of a more refined ICF based assessment tool to measure global functional impairment and its relationship to IQ, competition groups and sporting performance (Lemmey et al., 2021). The ICF has 1,400 codes to define the type and level of health impairment, not all of which are relevant to defining functioning affected by ID. The ICF browser allows relevant codes to be selected to be incorporated into a bespoke checklist, whilst keeping standardised operational definitions and being available in multiple languages. First using a Delphi study to agree on the relevant codes for inclusion in the questionnaire, Lemmey et al. (2021) then tested this bespoke questionnaire to examine if it could predict level of performance of athletes with ID and without DS. Within this study three groups were compared Virtus (elite), Special Olympics (non-elite) and DS. A comparison group of Special Olympic athletes were chosen as it represented a group with ID, not necessarily performing at an 'elite' level under International Sports Federation rules, and who were selected to not have DS or be competing for Virtus. Whilst athletes may compete in both Virtus and the Special Olympics and attain 'elite' status in both, the term elite is used here in the context of potentially on the Paralympic pathway and under the governance of the International Federation for that sport. The resultant checklist was found to discriminate between performance groups, met baseline psychometric standards and that once again ICF scores predicted group membership over IQ. However, for such a checklist to be used within classification, further research was required to refine and test the sensitivity of the instrument and to consider how a cut-off score could be arrived at to segment athletes into two or more performance classes.

This current study extends this research by developing the ICF questionnaire developed by Lemmey et al. (2021), further testing its psychometric properties and exploring the possibility of using it to establish a cut-off through which to provisionally allocate athletes into two competition classes based on levels of activity limitation. The research had three aims, firstly to examine the psychometric properties of the bespoke ICF checklist in more depth; to replicate previous categorical discrimination between athletes with DS and those with ID but without DS; and third to further test the checklist's discriminative powers, based on individual performance scores rather than categorical prediction.

Method

Design

The current study adopted a naturalistic cross-sectional, between-subjects design across three groups of athletes with ID, displaying different levels of sporting performance: Special Olympics (SO), Virtus (elite) and athletes with DS. It utilised three datasets to 1) investigate the psychometric properties of the ICF checklist, 2) test its discriminative powers and 3) explore a possible cut-off point on the ICF checklist to distinguish the higher and lower performers and test the hypotheses that there would be a difference in performance between the groups of athletes and this would be hierarchical such that current Virtus athletes without DS would perform better than athletes with DS. The first dataset, Dataset-2018, was the pre-existing database of elite and non-elite athletes who had completed the ICF questionnaire in the Lemmey et al. (2021) study. Dataset-GG was a new dataset, which consisted of new data collected at the Virtus Global Games, 2019 in Australia. Dataset-2020 was a dataset that combined both Dataset-GG and Dataset-2018.

Participants

Dataset-2018. This is the dataset that was used in Lemmey et al. (2018) and included a total of 102 athletes. All participants in Dataset-2018 had provided written consent for their data to be used for research purposes and therefore could be included in this study. All data were anonymised, with personally identifiable information removed. Dataset-2018 included athletes that competed at either elite (N=44) or non-elite (SO) (N=26) levels, and athletes with DS diagnosis (N = 32).

Dataset – GG. The inclusion criteria were: a Virtus accredited athlete (i.e. had their diagnosis of ID verified by Virtus), 18 years-old or above, were competing in an individual sport (so individual performance data was available) and be able to consent to participate. Athletes were also required to be accompanied by a coach, a carer or family member with good knowledge of their medical history who would act as a supporter in case athletes needed help in answering the questionnaire (referred to as supporters). Either the athlete and/or the supporter was required to speak English, however, versions of the ICF questionnaire were available in different languages. A total of 67 athletes completed the ICF questionnaire for Dataset-GG. These inclusion criteria were the same as Dataset-2018 for Lemmey et al. (2021), except for having to perform in individual sports. Both data sets were screened to ensure there were no repeat athletes included.

*Dataset-2020.*This dataset combined Dataset-GG with the pre-existing dataset, Dataset-2018, from Lemmey et al., (2021) and included 169 participants. A summary of all three datasets is shown in Table 1.

Table 1

Participant demographics

		Dataset-2018	Dataset-GG	Dataset-2020
Sample Size		102	67	169
Age (mean, SD)		26.02 (± 8.40)	24.69 (± 6.05)	25.49 (±7.57)
Gender	Female (n)	39 (38.25%)	25 (37.3%)	64 (37.9%)
	Male (n)	63 (62.65%)	42 (62.7%)	105 (62.1%)
Ethnicity	Asian (n)	5 (4.9%)	3 (4.5%)	8 (4.7%)
	Black (n)	5 (4.9%)	5 (7.5%)	10 (5.9%)
	Black African (n)	1 (1.0%)	2 (3.0%)	3 (1.8%)
	Black British (n)	2 (2.0%)	0 (0.0%)	2 (1.2%)
	Black Caribbean (n)	0 (0.0%)	2 (3.0%)	2 (1.2%)
	Brazilian (n)	0 (0.0%)	7 (10.5%)	7 (4.1%)
	British-Indian (n)	1 (1.0)	0 (0%)	1 (0.6%)
	Caribbean (n)	2 (2.0%)	0 (0.0%)	2 (1.2%)
	Indian (n)	0 (0.0%)	2 (3.0%)	2 (1.2%)
	Mixed (n)	2 (2.0%)	11 (16.4%)	13 (7.7%)
	White American (n)	2 (2.0%)	3 (4.5%)	5 (3.0%)
	White Australian (n)	13 (12.8%)	17 (25.4%)	30 (17.8%)
	White European (n)	69 (40.8%)	15 (22.3%)	84 (49.7%)
Nationality	France (n)	8 (7.8%)	22 (32.8%)	30 (17.8%)
	Brazil (n)	0 (0%)	7 (10.4%)	7 (4.1%)
	Australia (n)	19 (18.6%)	17 (25.4%)	36 (21.3%)
	Hong Kong (n)	8 (7.8%)	3 (4.5%)	11 (6.5%)

	Portugal (n)	0 (0.0%)	2 (3.0%)	2 (1.2%)
	Spain (n)	0 (0.0%)	1 (1.5%)	1 (0.6%)
	Czech Republic (n)	1 (1.0%)	2 (3.0%)	3 (1.8%)
	Finland (n)	0 (0.0%)	1 (1.5%)	1 (0.6%)
	India (n)	0 (0.0%)	2 (3.0%)	2 (1.2%)
	New Zealand (n)	0 (0.0%)	1 (1.5%)	1 (0.6%)
	Iceland (n)	0 (0.0%)	1 (1.5%)	1 (0.6%)
	Denmark (n)	0 (0.0%)	2 (3.0%)	2 (1.2%)
	USA (n)	2 (2.0%)	3 (3.0%)	5 (3.0%)
	Thailand (n)	0 (0.0%)	3 (3.0%)	3 (1.8%)
	UK (n)	61 (59.8%)	0 (0.0%)	61 (36.1%)
	Belgium (n)	2 (2.0%)	0 (0.0%)	2 (1.2%)
	Germany (n)	1 (1.0%)	0 (0.0%)	1 (0.6%)
Sport	Athletics (n)	14 (13.7%)	37 (55.2%)	51 (30.2%)
	Basketball (n)	14 (13.7%)	0 (0.0%)	14 (8.3%)
	Boccia (n)	2 (2.0%)	0 (0.0%)	2 (1.2%)
	Cricket (n)	11 (10.8%)	0 (0.0%)	11 (6.5%)
	Cycling (n)	1 (1.0%)	5 (7.5%)	6 (3.6%)
	Equestrian (n)	2 (1.2%)	0 (0.0%)	2 (1.2%)
	Football (n)	1 (1.0%)	0 (0.0%)	1 (0.6%)
	Netball (n)	3 (2.9%)	0 (0.0%)	3 (1.8%)
	Power lifting (n)	1 (1.0%)	0 (0.0%)	1 (0.6%)
	Swimming (n)	35 (34.3)	22 (32.8%)	57 (33.7%)
	Rowing (n)	0 (0.0%)	3 (4.5%)	3 (1.8%)
	Table tennis (n)	7 (6.9%)	0 (0.0%)	7 (4.1%)
	Tennis (n)	9 (8.8%)	0 (0.0%)	9 (5.3%)

	Ten pin bowling (n)	2 (2.0%)	0 (0.0%)	2 (1.2%)
Years competing	In current sport (mean, SD)	11.34 (± 7.09)	9.05 (± 5.42)	10.48 (± 6.58)
	In all sports (mean, SD)	11.87 (± 7.26)	12.21 (± 7.38)	12.00 (± 7.29)
Other Diagnoses	Epilepsy (n)	6 (5.9%)	8 (11.9%)	14 (8.3%)
	Autism (n)	31 (30.4%)	18 (26.9%)	49 (29.0%)
	Cerebral Palsy (n)	3 (2.9%)	2 (3.0%)	5 (3.0%)
Athlete Group	Down Syndrome (n)	32 (31.4%)	0 (0.0%)	32 (18.9%)
	Virtus non-DS (n)	44 (43.1%)	67 (100%)	111 (65.7%)
	SO non-elite non-DS (n)	26 (25.5%)	0 (0.0%)	26 (15.4%)

Materials

IQ scores. For Dataset-GG athlete's IQ scores were available through the Virtus eligibility accreditation system. For Dataset-2018 athletes were tested using the Wechsler Abbreviated Scale of Intelligence (Second Edition) (WASI-II) (Wechsler, 2011) as described in Lemmey et al. (2021).

Individual Performance Scores. Participants' performance data was collected from the results that are publicly available via the results page on the Virtus Global Games (GG) website. A standardised performance score (SPS) was obtained by comparing each athlete's performance to the corresponding world record in that event available on the Virtus website. For timed events such as swimming, rowing, cycling, and running, the SPS was calculated using the formula adopted by Gilderthorp and colleagues (2018). This used the world record in that individual event and applied the following formula to calculate the performance measure: Performance = (a/w) x 100, where a=athlete's time/distance/height/length and w=world record time/distance/height/length.

The ICF questionnaire. The first version of the ICF (ICF-35) questionnaire was developed as described in Lemmey et al., (2021) and included 35 items. In this study two questions on digestive functioning were added as a result of feedback from the previous research. This questionnaire is now referred to as ICF-37. In keeping with standard ICF procedure participants were asked to answer whether they experienced a specific health problem, and if so to rate how much of a problem it was, using a scale that ranged from "no problem" (score 0), "mild problem" (1) "moderate problem" (2), "severe problem" (3) to "complete problem" (4). An adapted visual analogue scale was used to help the athletes complete this task. The range of possible total ICF-37 scores was 0-148. Similarly, to Lemmey et al. (2021), translated versions of the official ICF questionnaire (available from the WHO online tool http://www.icf-core-sets.org/en/page0.php) in Finnish, Chinese, French and Spanish were used alongside the ICF-37 in case athletes/supporters who spoke those languages needed clarifications on the questions.

Post Questionnaire Interview. A post ICF-health interview was administered after the completion of the ICF-37 following the same protocol as Lemmey et al., (2021). The purpose was to gain feedback on the interview questions and the participant's experience of the interview.

Procedure

Ethics

The study received approval from a University's Ethics Committee which scrutinised both the procedures of collecting new data and using archival data from the Lemmey et al. (2021) study.

Recruitment

The Virtus Global Games is an international competition held every four years for elite athletes with ID. Accessible information about the study was made available on the GG website by promoting it with a video made by the researchers a few months before recruitment started. This video included both audio and subtitles and provided examples of administration of the ICF questionnaire to both English and Cantonese speaking athletes. This was done to provide a visual and concrete example of what athletes could expect should they wish to participate in the study. All participating countries' head coaches or team managers were contacted via email informing them of the purpose of the current project and asked to get in touch if any athlete expressed an interest to take part. Once the interest to participate in the project was received, the time and place for the interview was agreed together with the athlete's supporter to suit the athlete's schedule. Three countries had scheduled a training camp before the start of the Global Games and data was also collected at this event.

Administration of questionnaire

Athletes were interviewed in private rooms where possible, and always with a supporter, which in all cases were their coaches. Following completion of the consent form the ICF-37 was administered using the visual analogue scale to rate any functional problems identified. Following the protocol of Lemmey et al (2021) the researcher asked the athlete each item and provided additional explanation from the ICF operationalised descriptions if required. Print versions of the questionnaire were also available in different languages for reference where necessary. After the completion of ICF-37, participants were asked to complete the post-interview questionnaire. The whole interview process ranged from approximately 30 minutes to one hour.

Data analysis

Since Dataset-2020 included athletes who completed two different versions of the questionnaire (ICF-35 and ICF-37 Dataset-GG), when comparing the two datasets ICF-37 scores were converted to ICF-35 scores by subtracting the scores from the two new questions in the questionnaire. Data analysis explored the frequency of health conditions within and between groups, followed by an examination of the psychometric properties of the ICF. Group difference in ICF scores were examined and the means compared using ANOVA. The correlational relationship between sports performance and ICF score was investigated and the predictive relationship between these variables and IQ was examined using multiple, hierarchical regression. Finally, a potential cut-off ICF score was considered by comparing group means on performance score using the mean ICF score derived from the DS group. All data analyses were carried out using the SPSS statistical analysis software, version 27 (IBM Corp., 2020).

Results

ICF-37 results

The average ICF-37 score was 8.04 (± 8.03), with a minimum score 0 and a maximum score 46, out of a possible range of 148. ICF-37 yielded slightly lower scores to Lemmey et al. (2021) ICF-35 version (mean 8.49± 7.92) due to the inclusion of athletes with DS in that dataset, who would have scored higher due to greater physical health problems (Lemmey et al., 2021). Dataset-GG yielded lower rates of assistive devices (glasses 33 %, hearing aid 1.5%, (indicative of underlying co-morbid sensory conditions) use compared to Dataset-2018 which showed 60% of participants to make use of devices and almost 50% of athletes reporting to wear glasses. A statistically significant difference was found in the overall prevalence of health problems between the two datasets with higher prevalence in Dataset-2018 X^2 (2, N= 167) =18.6, p<0.01. This is not surprising as this dataset also included non-elite athletes and athletes with DS, who are known to have a greater number of health problems (Kinnear et al., 2018). The most common five health problems other than sight for Dataset-G G compared to Dataset-2018 are shown in Table 2.

Table 2

Five most prevalent health problems Dataset-2018 and Dataset-GG

Health problem	Dataset-2018 Prevalence (%)	Dataset-GG Prevalence (%)
Energy and drive	24.5	31.3
Maintaining health body weight	29.4	26.9
Sensations of pain	31.4	25.4
Immune system	—	20.9
Complex voluntary movement	27.5	16.7
Muscle tone	28.4	—

Psychometric properties of ICF-37

ICF-37 conveyed a 'good' internal consistency with a Cronbach's α= 0.81 (Field, 2013) which was higher than the previous ICF-35, which yielded a Cronbach's α of 0.75 (Lemmey et al., 2021). Further analysis showed that ICF-37 Cronbach's α's value was not improved by removing any items. Three trained researchers administered the questionnaire. Researcher 1 interviewed 51 athletes (76.1%), Researcher 2 interviewed 10 athletes (14.9%) and Researcher 3 interviewed 6 athletes (9.0%). ICF-37 scores did not differ significantly across researchers $\chi_2(2) = 4.819$, $p > 0.05$, showing good interrater consistency. Outliers observed may be an artefact due to the greater number of people seen by Researcher 1. Convergent validity was examined through correlating IQ scores and ICF scores, as previous research has demonstrated a relationship between IQ and prevalence of health issues (Gilderthorp et al., 2018; Wraw et al., 2015). Here, the combined Dataset-2020 (N=169), making the adjustment of excluding the extra two items in ICF-37 was used, to include athletes with DS, greater variability and a larger dataset. A statistically significant negative correlation between IQ and questionnaire scores ($r_s(8) = -.217$, $p = .006$) was found suggesting supporting convergent validity that participants who had lower IQ scores also have greater physical health problems. Whilst this gives some evidence of convergent validity the correlation is low and so should be treated with some caution.

Group comparisons

The range and distribution of scores on the ICF-35 for each of the three athlete groups are shown in Figure 1. A one-way analysis of variance was conducted to examine the null hypothesis that there was no difference between the category of athlete and their score on the ICF-35. The independent variable for athlete groups included Virtus (M=6.85, SD = 8.01, n=111), Special Olympic (M=8.58, SD=8.58, n=26) and Down Syndrome (M=11.7, SD=11.72, n=26) athletes. The assumption of normality for all groups was supported, as was Levine's test of homogeneity of variance ($F(2,166 = .26$, $p=.88$). The ANOVA showed a significant main effect of athlete group on ICF-35 score, $F(2,166) = 4.86$, $p= .009$. Post hoc analysis using Tukey's HSD indicated that ICF-35 scores were significantly higher in DS athletes compared to Virtus athletes ($p=.007$), but there was not statistical difference between the SO and Virtus or SO and DS groups of athletes. This indicates that the athletes with DS had significantly more health issues than the Virtus athletes, but not the SO athletes..

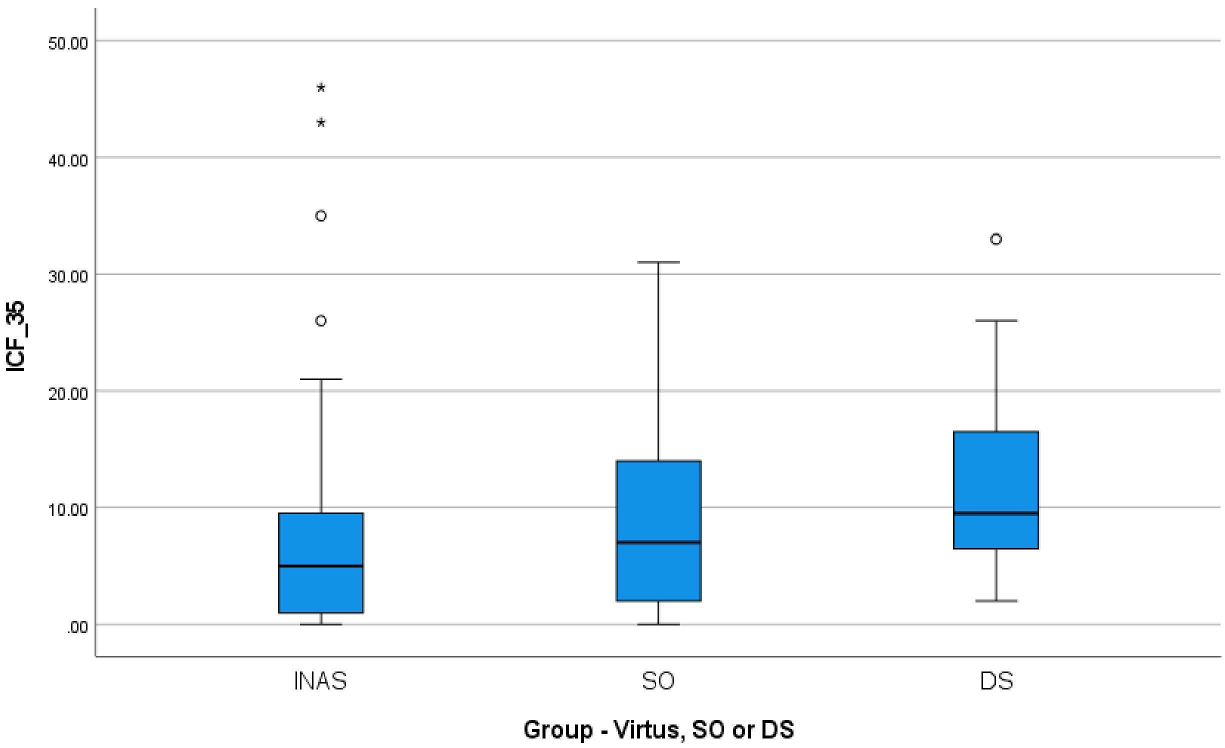

Figure 1: *Boxplot showing Dataset-2020 ICF-35 scores by athlete group*

ICF scores compared to individual sports performance

For this analysis only Dataset-GG was used. The mean performance was 118.50% (±17.57%), with a minimum of 96.86% and a maximum of 193.84%. meaning the average performance was about 20% lower than the world record, a world record was broken, and the least well performing athlete's time was nearly double that of the world record. Figure 2 shows the spread of these scores.

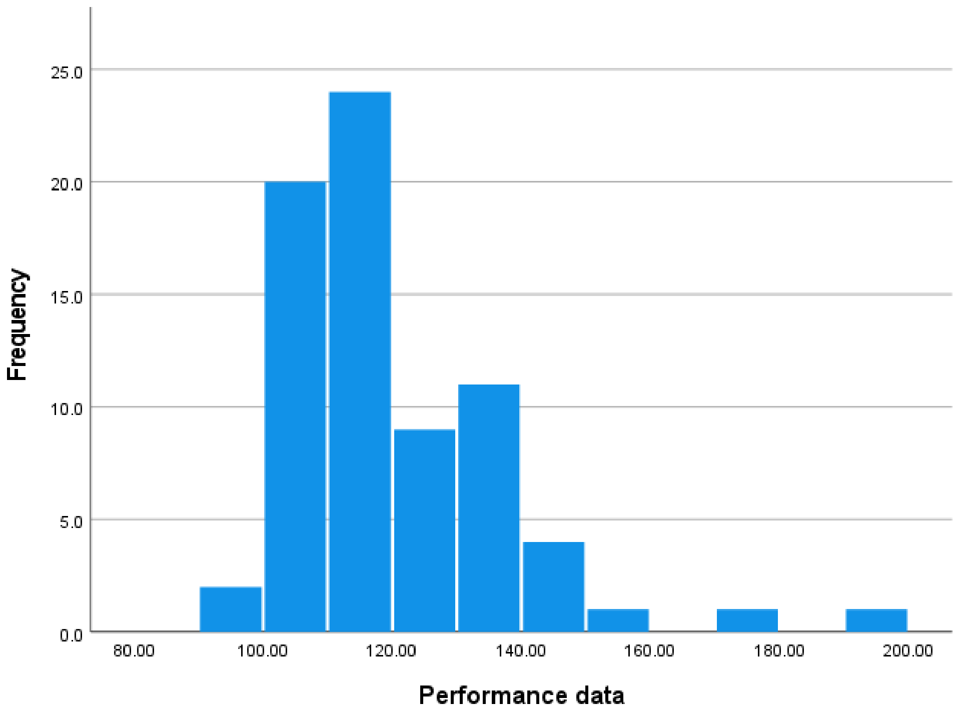

Figure 2*: Histogram showing the performance variability.*

There was a low significant negative correlation between ICF-37 scores and sports performance, *r* = 0.33, *p* = 0.007, replicating previous research showing that health status may have relationship with sports performance (Gilderthorp et al., 2018).

A multiple hierarchical regression was carried out to predict performance based on individual's IQ and ICF-37 scores, with IQ being step one and ICF score step 2. Assumptions of linearity, normality and homoscedasticity were checked prior to the regression analysis and were found to be within accepted parameters. A significant correlation was found between performance and ICF-37 scores, (r = 0.332, p = 0.003), showing that functional physical health status as captured by the ICF-37 is related to wider functional abilities, in this case, sports performance. As expected, there was no significant correlation between IQ and performance (r = -0.032, p = 0.786). The results indicated that the model explained 11.1% of variance and that the model was a significant predictor of athletic performance, F (2,62) = 3.855, p = 0.03. IQ did not contribute significantly to the model (B = -0.03, p = 0.90), whereas ICF-37 scores did (B = 0.68, p < 0.05), suggesting that IQ is not a good predictor of sports performance, but functional health status is.

Potential cut-off point for class II2 class inclusion

In this analysis the combined Dataset-2020 using ICF-35 was used. Athletes who present with similar level of physical health difficulties or impairment as athletes with DS are expected to have similar functional abilities and therefore perform at a similar level to athletes with DS. This research question explored whether an ICF-health based questionnaire can be used to group non-DS athletes at a similar functional level to athletes with DS, meaning that their sports performance is at a similar level and they can compete fairly together. The mean ICF-35 score of athletes with DS was 12 which was used as a reference point to compare groups. The Standard Performance Scores (SPS) scores between non-DS athletes with ICF-35 < 12 were compared to the non-DS athletes with ICF-35 >12. A statistically significant difference in SPS (%) was observed between athletes who scored higher than 12 (128.02% ± 5.82) and athletes who scored lower than 12 (114.42 ± 1.53), U= 220, p= 0.035 (see Figure 3), showing that using a cut off score of 12 the ICF-35 discriminated between higher and lower sports performance. This suggests that physical health as captured by ICF-35 has potential to classify athletes according to their functional ability, which may predict sporting performance.

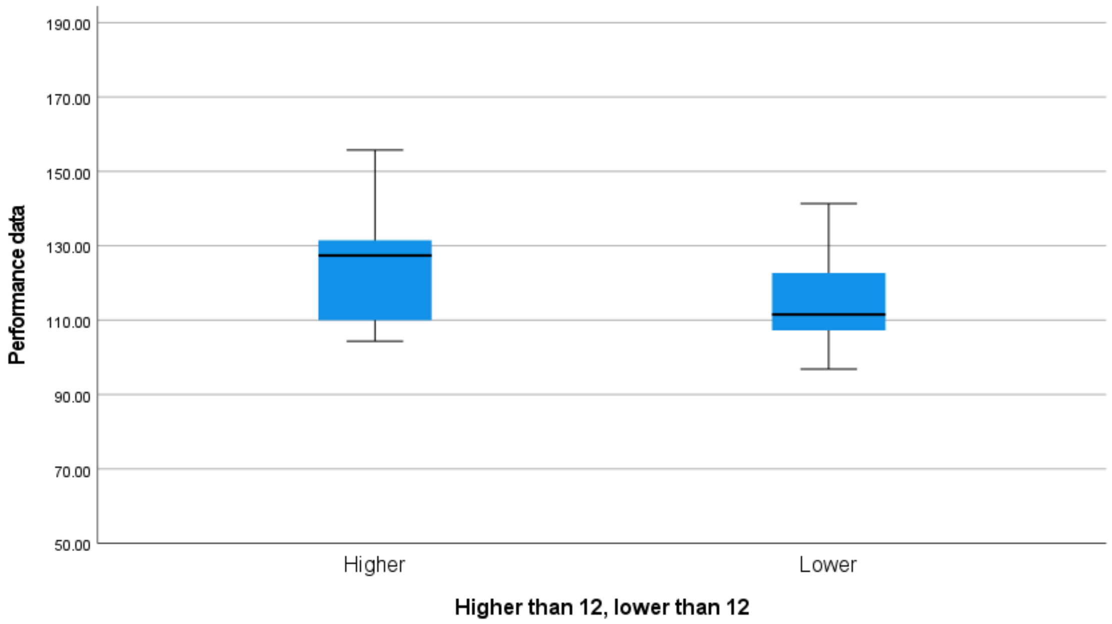

Figure 3: *Boxplot showing performance for non-DS athletes with ICF-35 scores higher and lower than 12, with outliers removed*

Post-questionnaire results

Ninety-one percent of athletes thought that the length of the questionnaire was ‘just right’ and six percent judged it to be ‘long but OK’. This suggests that carrying out the questionnaire is not an uncomfortable process for individuals. Feedback on the difficulty of the questionnaire showed that the majority understood either all of the questions (79.1%) or most of them (13.4%), and everyone was able to answer them with the help of the supporter present, suggesting that athletes were able to complete the questionnaire. No further suggestions to include additional items on physical health were made by either athletes or supporters were made.

Discussion

The sports-related aim of this project was to explore if an ICF-based questionnaire could be used as a classification tool to group more functionally impaired athletes together (those with or without DS) to compete fairly in Parasports. The results showed that the

ICF-37 questionnaire captured the sort of health issues which are common within the ID population, had good psychometric properties, and was acceptable to the athletes in relation to administration. The ICF has the potential to discriminate between sport performance groups once further research is conducted. This study replicated previous findings that a measure of overall functional health status is a better predictor of sporting performance than IQ (Gilderthorp et al., 2018; Lemmey, et al., 2021). The very high comorbidity and multi-morbidity associated with ID was also further evidenced, as even in this in the sample drawn from the pinnacle of Virtus ID athlete performance, the Global Games, the mean number of additional health conditions was eight. Whilst this is lower than the 11 found in the cohort study by Kinnear et al. (2018), as might be expected, it is higher than might be expected for elite athletes, and demonstrates the weight of additional health based functional impairment associated with ID.

In terms of this questionnaire being used as part of a classification process into impairment-based competition groups it shows promise. It potentially has the discriminatory powers required and using the mean ICF-37 score from the athletes with DS as a benchmark inclusion criterion to this additional competition class, it would include the majority of athletes who through additional functional health impairments would perform significantly lower. Furthermore, by using the cut-off point based around the health profile of athletes with DS, not only does it include a better opportunity for these athletes in this second class, but also includes other athletes similarly impaired who may perform at a similar level, and as such is in keeping with the IPC approach to classification. These are preliminary findings and it should be acknowledged that they are based on self-report and as such within the strict parameters of IPC classification, further steps would be required to verify the existence and severity of the health conditions reported. As such the ICF questionnaire could be used as screening instrument and further verification could then be sought through medical examination and reporting. A final step would then be required which would be to establish the minimum impairment criteria for this second class on a sport-by-sport basis.

Further work is required to fully establish the psychometric properties of the questionnaire including factor analysis, which would require a large sample size. It would also be helpful to administer the ICF-37 questionnaire to a sample of people with ID who are not athletes to further explore its discriminatory potential. The questionnaire is self-report so work on the relationship between verified and reported conditions would be helpful. Finally, field testing of using the questionnaire to allocate athletes into competition classes and comparing sporting performance is required to verify the validity of this process and any cut-off scores used.

Limitations

It must be acknowledged that the ICF-37 predicted only 11% of the variance in performance which suggests that there are likely to be multiple other factors which influence performance. Such factors may include the availability and quality of training, and competition opportunities. Whilst the high performing athletes were recruited at the pinnacle of the Virtus events calendar, the Global Games, this still represents a perhaps larger range of sporting performance than might be expected in mainstream international competitions. For example, some athletes had not competed internationally before and it was the first time that their nations had been represented in the GG. This spread of performance outcomes may have also impacted the distinction between the assumed higher (Virtus) and lower performing (SO) groups such that some athletes fell into a middle band delivering similar level performances. Although 17 nations were represented in the sample, the majority of participants originated from Australia, France and the UK.

This was due to the availability of athletes at the recruiting events. Given that all three countries have higher economic status than other competing nations it might be that these athletes have access to better health care influencing the identification and treatment of co-morbid health conditions. Finally, the ICF-35 and ICF-37 are self-report measures and as such may be open to reporting bias, which requires further investigation in comparison to data obtained through more direct measures.

Conclusions

The prevalence of additional health conditions which accompany a diagnosis of ID has a clear impact upon the functional capacity of this population and in turn impacts on the sporting performance of these athletes. Classifying athletes into different competition classes just on the basis of ID diagnostic criteria, such as IQ, does not take account of this accumulative impact and therefore a more holistic approach is required focussing on the overall functional capacity of the athlete. This research provides further evidence that taking an ICF-based approach takes account of this challenge and that an ICF-derived questionnaire may be a useful tool in this classification process. The findings show that ICF-37 can distinguish between physical health problems within populations of athletes with ID. As such, the ICF-37 has the potential to be used in the sports classification system to differentiate athletes based on their functional health status and allow for fairer sporting competition and greater inclusion. Further steps are required to fully develop this approach to classifying athletes with ID, but this research suggests both a conceptually and practically viable methodology for this task.

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