

BACKGROUND

Selective classification systems are used in para sports with impairment defined as the unit of classification. The purpose of these systems is minimize the impact of impairment on the outcome of competition. In order to determine the aspects of impairment that are most important to measure during the classification process, the influence of the impairment on performance must be evaluated.

In 2018 World Para Athletics added additional activity limitation tests to the classification process for athletes with hypertonia, athetosis, and ataxia. The influence of these new assessment procedures in helping classifiers determine the impact of impairment on function and sport performance is not yet known. One way to assess if the current classification assessments are accurately identifying impairment levels with differing influence on sport performance is to look for measurable differences in the sport performance of those assigned to different classes.

PURPOSE

The purpose of this study was to determine if there are measurable differences in spatial-temporal parameters during 100-meter races for athletes recently classified as T35 through T38. This information will help determine if current classification processes are identifying classes with different performance variables as well as provide guidance for classifiers regarding which aspects might be most important to observe during technical and observational assessments.

METHODS

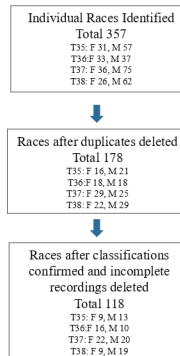
This study was a retrospective study design involving pre-recorded video footage of 100 meter international para-athletic competitions for athletes classified as T35, T36, T37 or T38.

Inclusion/Exclusion Criteria:

Para athletes who were internationally classified in 2018 or 2019 with the class of T35 to T38 and competed in a 100M race for their assigned class between 2015-2019 that was recorded and made available on YouTube were included in the study.

Para athletes were excluded from the study if

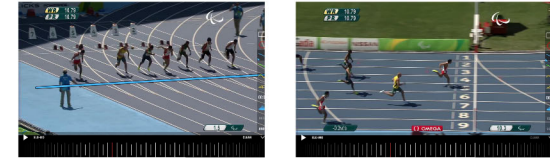
- They were not visible on the recording during entire race
- They competed in a class other than the class assigned in 2018 or later
- There was a recording of a 100M race with a faster time available for analysis (duplicates were deleted)



Qualifying videos were selected via YouTube and uploaded to Coach's Eye for analysis.

Data Analysis:

- Each athlete's race performance was analyzed by two separate researchers to determine:
 - Total race time (determined by reported race outcomes)
 - Time for first 13 meters
 - Number of steps
 - Arm swing symmetry (0-3 ordinal rating)
- If there was greater than 10% disagreement on values between 2 researchers, a 3rd researcher independently analyzed the video and the median was used.
- From this data, additional performance parameters were calculated:
 - Average step length (100m / number of steps)
 - Average step frequency (number of steps / official race time)
- Data from T35, T36, T37 and T38 male and female athletes were compared using a Kruskal-Wallis Test with Bonferroni correction.



DISCUSSION

Significant differences in race time and time to the 13-meter mark in both male and female athletes support performance differences between T35/T38.

Findings also suggest possible differences between T36/T37, T36/T38, and T37/T38 in time to the 13-meter mark or arm swing symmetry, but these were not consistent across sexes.

Interestingly, a trend for decreasing number of steps and increasing step length was seen across all classes except for T36 and T37 males. This finding, along with the significant difference in time to the 13-meter mark for T36/T37 classes seen only in females, suggests that differentiation in performance variables between these two classes is not consistent. Further analysis with specific focus on these two classes may be warranted.

Overall the findings of this study suggest that the current classification process may not be adequate in differentiating factors that lead to differences in performance variables and continued adjustments to the system are still needed. Other factors may also be contributing to the results, and need to be considered:

- Sprinters have been shown to have their own unique running style, relying more on step frequency or step length in order to achieve optimal speed outcomes (Salo et al., 2011).
- Number of training years, age and medical management can affect performance (Atunes et al., 2017)
- ROM, but not coordination, has been found to correlate with sprint performance (Connick et al., 2015)

Future research on performance measures will need to include a larger sample size and multiple filming angles to allow for full visibility of all parameters to be accurately assessed

CONCLUSIONS

This study supports differences in performance across the classes of T35, 36, 37 and 38, with the most significant differentiation between T35 and T38. Trends for decreasing step count and increasing step length seen across classes may warrant further analysis.

Overall differences in parameters are not consistent across classes and suggest that continued research is needed to determine which measurable aspects are important to the classification process and the best means for attaining these measurements within the classification setting.

RESULTS

Males

Classification	100M Time (sec)	Time for first 13M (sec)	Number of Steps	Average Step Length (m)	Average Step Frequency	Arm Swing
T35	12.93 (.62)*	2.50 (.22)*	55.0 (3.97)	1.83 (.14)	4.30 (.21)	1.69 (.95)
T36	12.55 (.46)	2.48 (.24)*	52.0 (2.83)	1.93 (.10)	4.14 (.18)	2.10 (.99)
T37	12.47 (.78)	2.34 (.15)	53.11 (3.48)	1.89 (.12)	4.28 (.17)	1.80 (.83)
T38	11.98 (.66)*	2.26 (.15)*	51.59 (4.43)	1.95 (.16)	4.34 (.30)	2.32 (.75)
p-value	.002	.005	0.108	0.108	0.258	0.155

* Significant at 0.05 level

For males, there were significant differences in race time between T35/T38 classes and time to 13-meter between T35/T38 and T36/T38 classes

Females

Classification	100M Time (sec)	Time for first 13M (sec)	Number of Steps	Average Step Length (m)	Average Step Frequency	Arm Swing
T35	15.50 (1.26)*	2.84 (.22)*	60.50 (3.87)	1.66 (.11)	4.21 (.25)	2.56 (.73)*
T36	15.12 (.92)*	2.80 (.15)*	58.13 (2.70)	1.72 (.08)	3.95 (.29)	2.19 (.83)
T37	14.29 (1.01)	2.63 (.13)*	57.0 (0.50)	1.76 (.11)	4.12 (.22)	1.73 (.63)*
T38	13.44 (.60)*	2.51 (.12)*	55.0 (2.08)	1.82 (.70)	4.18 (.27)	2.56 (.73)*
p-value	.000	.002	0.058	0.056	0.385	0.008

* Significant at 0.05 level

For females, there were significant differences in race time between T35/T38 and T36/T38 classes, time to 13-meters between T35/T38, T36/T38, and T36/T37 classes, and arm swing between T35/T37 and T37/T38 classes.