



Predictors of hydrodynamic technical and tactical training system for blind and partially sighted paralympic swimmers

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Abstract

Objective of the study was to analyze and test benefits of a new individual technical abnormalities sensitive technical and tactical training system for blind and partially sighted swimming elite.

Methods and structure of the study. We made a qualifying analysis of the surface/ underwater swimming technique videos to rate every phase in the Paralympic swimmers' techniques in every style, with occasional applications of skin-fixed LED indicators [1]; plus an expert survey and practical experience analyses by specific topics on a sample of the blind and partially sighted elite (Masters of Sports, World Class Masters of Sports, Honored Masters of Sports) coaches

Results and conclusion. The study found specific and typical individual technical abnormalities in the elite blind and partially sighted sample, with their identification and classification showing the coach and athlete the individual technical and tactical training service and swimming technique improvement needs and priorities. We believe that the individual technical abnormalities should no more be perceived as swimming technique errors in the blind and partially sighted swimming sport as they are necessitated by the individual blind-and-partially-sighted-related primary locomotion patterns. We analyze herein the individual technical abnormalities classes and differences with practical correction options.

Keywords: *blind sports, Paralympic swimmer, technical and tactical, abnormalities, predictors, reserves, technical abnormalities, correction.*

Background. Individual technical abnormalities may be defined as deviations in the Paralympic swimmers' motor skills as compared to that of the healthy peers due to blind-and-partially-sighted-related functional, physical and psychological limitations that need to be respected by the blind-and-partially-sighted-specific technical and tactical training service [2,3]. Such individual technical abnormalities have long been unwelcomed as technical errors of the blind and partially sighted athletes, and only recently were recognized as the lifelong individual swimming versions necessarily customized to the physical conditions, world imaging, spatial orientation specifics, etc., that naturally differ from the healthy ones. It is these "errors" that are addressed by the technical and tactical training model analyzed herein. We re-qualified these errors with individual technical abnormalities classes subject to individualized technical and tactical training service with the

relevant corrective tools. In other words, the individual technical abnormalities-customized technical and tactical training model lists and prioritizes the correction/ compensation process goals to facilitate progress in the Paralympic swimming skills, techniques and tactics.

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Table 1. Specific individual technical abnormalities versus the key blind and partially sighted elite's swimming technique elements

Swimming technique elements	Individual technical abnormalities
1. Body propulsion angle, degrees	Muscle tensions due to fear of collision
2. Legs working angle, degrees	
3. Knee bending angle, degrees	
4. Mid-stroke elbow bending angle, degrees	
5. Post-stroke elbow bending angle, degrees	
4. Elbow bending range, degrees	Misperceptions of own motor skills
Cycle time, s	
Stroke phase time, s	—
Rhythm, %	Fear of collision prior to turns
Pace, cycles/ min	

es (n=9). We analyzed 352 individual swim videos captured in trainings and competitions in 2019-2021 within the ongoing research and practical support service to the Russian Paralympic blind and partially sighted

swimming elite. The nine elite coaches were subject to verbal semi-structured survey and interviews to prioritize the key individual technical abnormalities versus the training service goals.

Table 2. Typical individual technical abnormalities versus the key blind and partially sighted elite's swimming technique elements with correction options

Key typical individual technical abnormalities	Manifestations of the typical individual technical abnormalities in the swimming technique need to be corrected	Swimming technique correction options
1. Muscle spasm	Early stop of the stroke, water pull inefficiency, faults in the stroke curve	Correctable by massage
2. Zigzag swim trajectory	Longer swim and harder work on distance	Provisionally correctable by in-water support/ guidance, feel of water and spatial control improvement service
3. Strength shortage	Early stop of the stroke, elbow/ wrist bending errors, downward stroking	Correctable by strength trainings
4. Imperfect stroking curve	Early stop of the stroke, faults in the stroke and/ or hand dip curve	Correctable by in-water support/ guidance, feel of water and spatial control improvement service
5. Low coordination skills	Early stop of the stroke, faults in the stroke and/ or hand dip curve	Correctable by ground workouts with the controlled movement mimicking practices
6. Stiff joints	Short extension of hands on dip, short stroke	Correctable by flexibility training
7. Fear of side collision		Provisionally correctable by supported turns, feel of water and spatial control training service
8. Too high dip angle	Inadequately streamlined position prone to vertical one	Correctable by massage (of very tense muscles) and swimming technique excellence
9. Low speed/ speed-strength endurance	Slow-downs on distance, stalled competitive progress	Correctable by special endurance trainings
10. Movement asymmetry	Stroking asymmetry	Correctable by in-water guidance, stroke imaging, feel of water and spatial control training service



Results and discussion. The survey and analyses found specific and typical individual technical abnormalities in the blind and partially sighted elite sample. *Specific individual technical abnormalities* may be defined as dictated by the individual diagnoses (nosology) and their effects on the motor skills of the blind and partially sighted athletes. The specific individual technical abnormalities were basically classified into (1) muscle tension due to fear of collision; (2) misperceptions of own motor skills; and (3) fear of collision prior to turns. Table 1 lists the individual technical abnormalities contributions to the eight key swimming technique elements. It should be noted that two of the swimming technique elements (cycle time and stroke phase time) were tested insensitive to the individual technical abnormalities.

Typical individual technical abnormalities may be defined as the basic swimming technique deviations due to specific combinations of health conditions with the associating morphological and functional issues – fairly common for the blind and partially sighted athlete's functionality classes. Table 2 lists the functionality class unspecific typical individual technical abnormalities of the blind and partially sighted elite. We found that most of the typical individual technical abnormalities of the sample may be corrected completely or partially, conditional on the technical and tactical training service being well customized to the individual conditions, resources and progress goals.

On the whole, we found typical individual technical abnormalities for eight functionality classes out of nine, namely S11, S12, S13, SB11, SB12, SB13, SM12 and SM13.

Conclusion. The individual technical abnormalities grouped and analyzed in the study are recommended for application by coaches of the blind and partially sighted swimmers to effectively identify and analyze the individual technical and tactical training progress lapses, needs and options; find the options most beneficial for every blind and partially sighted athlete; and select one of four main swimming styles as potentially most beneficial for competitive progress agenda of the athlete.

References

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