

## Testing of the Movement Imagery Questionnaire for Children on a Russian Sample of Young Athletes<sup>□</sup>

Aleksander N. Veraksa, Anastasia A. Yakushina\*

Lomonosov Moscow State University, Moscow, Russia

\*Corresponding author. E-mail: anastasia.ya.au@yandex.ru

### ABSTRACT

**Background.** One of the most effective ways to improve the effectiveness of training and performance in sports is movement imagery. It promotes an understanding of the skill components and schema of action. For better sports achievement, imagery should be used for training athletes starting in childhood. However, Russian sports science lacks a tool to determine the types of images that children should use to train their skills.

**Objective.** The aim of our study was to test the Movement imagery Questionnaire for Children (MIQ-C), which was developed by Canadian researchers R. Martini and colleagues, on Russian athletes.

**Design.** First, we analyzed the studies that demonstrate the importance of using mental images in the training process. Then, an empirical study of the mental representation of movements in 112 Russian young athletes from ages 7 to 12 was conducted with the aid of the pre-adapted MIQ-C.

**Results.** The three types of mental images that are most often used by young athletes were identified: 1) first-person visualization; 2) third-person visualization; and 3) visualization of muscle performance. The last one (called kinesthetic) is the most difficult for the children. The highest rates of use of all three methods were noted in children 9-10 years old. In the course of our work we compared the results obtained for the Russian sample with the results of the Canadian researchers. We found that Russian athletes assess their capabilities for visualization higher than young athletes in Canada.

**Conclusion.** As a result of testing the Movement Imagery Questionnaire for Children on a Russian sample of young athletes, the reliability-consistency of the methodology was verified. The results of Canadian and Russian athletes were compared. It was also demonstrated that kinesthetic representation of movements is the most difficult for children, compared to one-person and three-person representations.

**Keywords:** Sports psychology; mental training; mental image; movement imagery; young athletes; children; Movement Imagery Questionnaire for Children (MIQ-C)

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**Highlights:**

- The mental imagery of movements contributes to more successful learning of motor skills by children in sports.
- Children 7-12 years old most often use third -person perspective imagery to represent the movements they perform.
- Kinesthetic representation, although effective, is the most difficult for young athletes and requires special training.

**АННОТАЦИЯ**

**Актуальность.** Одним из эффективных способов повышения эффективности тренировок и выступлений в спорте является образное представление движений. Это способствует пониманию компонентов умения и схемы действий. Для достижения лучших спортивных результатов образное представление следует использовать при подготовке спортсменов, начиная с детства. Однако в российской спортивной науке отсутствует инструмент определения типов образов, которые детям следует использовать для тренировки своих навыков.

**Цель.** Цель работы — апробация на русскоязычной выборке методики «Исследование мысленных представлений движений у детей (Movement Imagery Questionnaire for Children — MIQ-C)», разработанной канадскими исследователями (Р. Мартини с коллегами).

**Материалы и методы.** Сначала мы проанализировали исследования, демонстрирующие важность использования мысленных образов в тренировочном процессе. Затем с помощью предварительно адаптированного MIQ-C было проведено эмпирическое исследование образного представления движений у 112 российских юных спортсменов в возрасте от 7 до 12 лет.

**Результаты.** Выявлены три типа образных представлений, которые чаще всего используются юными спортсменами: 1) визуализация от первого лица; 2) визуализация от третьего лица; и 3) визуализация работы мышц. Последнее (называемое кинестетическим) представление является самым сложным для детей. Самые высокие показатели использования всех трех способов отмечены у детей 9–10 лет. В ходе нашей работы мы сравнили результаты, полученные на российской выборке, с результатами канадских исследователей. Мы обнаружили, что российские спортсмены оценивают свои возможности по визуализации выше, чем их сверстники из Канады.

**Выводы.** В результате апробации Movement Imagery Questionnaire for Children (MIQ-C) на российской выборке юных спортсменов была проверена надежность и валидность методики. Сравнились результаты канадских и российских спортсменов. Показано также, что кинестетическое представление движений является наиболее трудным для детей по сравнению с визуализациями от первого и третьего лица.

**Ключевые слова:** Спортивная психология; ментальная тренировка; ментальный образ; образное представление движения; юные спортсмены; дети; опросник «Образное представление движений» для детей (MIQ-C)

**Ключевые положения:**

- Мысленные образы движений способствуют более успешному овладению детьми двигательными навыками в спорте.
- Дети в возрасте 7–12 лет чаще всего используют изображения в перспективе от третьего лица для представления выполняемых ими движений.
- Кинестетическое представление, хотя и эффективно, является наиболее сложным для молодых спортсменов и требует специальной подготовки.

## RESUMEN

**Introducción.** Una de las formas más eficientes de mejorar la eficacia del entrenamiento y el rendimiento en el deporte son las imágenes de movimiento. Promueve la comprensión de los componentes de la habilidad y del esquema de acción. Para mejorar el rendimiento en el deporte, las imágenes deben aplicarse desde los niños. Sin embargo, la ciencia del deporte rusa carece de una herramienta para determinar los tipos de imágenes que utilizan los niños para entrenar sus habilidades.

**Objetivo.** El objetivo del estudio fue probar el método “Cuestionario de movimiento imaginario para niños”, desarrollado por los investigadores canadienses (R. Martini y colegas), en atletas rusos.

**Diseño.** Se describió el análisis de estudios que demuestran la importancia del uso de imágenes mentales en el proceso de entrenamiento. Se llevó a cabo un estudio empírico de la representación mental de los movimientos en 112 jóvenes atletas rusos de entre 7 y 12 años con la técnica preadaptada MIQ-C.

**Resultados.** Se revelaron los principales tipos de imágenes mentales que más utilizan los deportistas jóvenes: visualización en primera persona, visualización en tercera persona y visualización del rendimiento muscular. El último (cinestésico) es el más difícil para los niños. Las tasas más altas de uso de los tres métodos se observaron en los niños de 9 a 10 años. Durante el trabajo se compararon los resultados obtenidos de la muestra rusa con los resultados de los investigadores canadienses. Se reveló que los atletas rusos valoran mejor su capacidad de visualización que los atletas jóvenes de Canadá.

**Conclusión.** Como resultado del estudio, se probó el «Cuestionario de imágenes de movimiento para niños» en una muestra de jóvenes atletas rusos. Se verificó la fiabilidad de la consistencia del instrumento. Se compararon los resultados de los atletas canadienses y rusos. También se demostró que la representación cinestésica de los movimientos es la más difícil para los niños en comparación con la representación de 1 y 3 personas.

**Palabras clave:** Psicología del deporte; entrenamiento mental; Imagen mental; imágenes en movimiento; atletas jóvenes; niños

### Destacados:

- La visualización mental de los movimientos contribuye a un aprendizaje más exitoso de las habilidades motoras por parte de los niños en los deportes.
- Los niños de 7 a 12 años suelen utilizar imágenes en perspectiva en tercera persona para representar los movimientos que realizan.
- La representación cinestésica, aunque eficaz, es la más difícil para los deportistas jóvenes y requiere un entrenamiento especial.

## RESUME

**Origines.** L'imagination du mouvement est l'un des moyens les plus progressistes d'augmenter l'efficacité de l'entraînement et de la performance sportive. Cela favorise la compréhension des composantes de la compétence et du modèle d'action. Pour obtenir de meilleurs résultats sportifs, l'imagerie doit être utilisée dès l'enfance. Cependant, dans les outils psychologiques russes, il n'existe pas de méthodologie spéciale pour cultiver la capacité de pensée imaginaire du mouvement chez les jeunes athlètes.

**Objectif.** L'objectif du travail est de tester la méthodologie « Questionnaire en Imagerie du mouvement mental (Movement Imagery Questionnaire for Children — MIQ-C) » développée par des chercheurs canadiens (R. Martini et collègues) sur un échantillon de jeunes athlètes russes.

**Mise au point.** Analyse d'études qui démontrent l'importance de l'utilisation de l'imagerie mentale dans le processus de formation. Étude empirique de la représentation figurative des mouvements chez 112 enfants athlètes russes âgés de 7 à 12 ans à l'aide d'une technique MIQ-C préadaptée.

**Résultats.** Les principaux types d'images mentales les plus souvent utilisées par les jeunes sportifs ont été identifiés : la représentation à la première personne, à la troisième personne et le travail musculaire. Cette dernière (la représentation kinesthésique) est la plus difficile pour les enfants. Les taux d'utilisation les plus élevés des trois méthodes ont été observés chez les enfants de 9 à 10 ans. Une comparaison des résultats obtenus à partir de l'échantillon russe avec les résultats de chercheurs canadiens a montré que les jeunes athlètes russes évaluent leur capacité à représenter mentalement des mouvements un peu plus haut que leurs pairs du Canada.

**Conclusion.** Il faut élargir l'échantillon en sélectionnant des athlètes parmi les sports qui ne sont pas représentés à ce stade des travaux, et de vérifier la validité de la version russe de la méthodologie sur un échantillon élargi.

**Mots-clés:** Psychologie du sport; entraînement mental; image mentale; images de mouvement; jeunes athlètes; enfants

**Points principaux:**

- Les images mentales du mouvement contribuent à une meilleure acquisition des capacités motrices dans le sport par les enfants.
- Les enfants âgés de 7 à 12 ans utilisent le plus souvent des images en perspective à la troisième personne pour représenter les mouvements qu'ils effectuent.
- La présentation kinesthésique, bien qu'efficace, est plus difficile pour les jeunes athlètes et nécessite un entraînement spécial.

## Introduction

Studies on *mental imagery of movements (MIM)* in adult and young athletes have been conducted both abroad and in Russia (Kaminsky, & Veraksa, 2014; Kaminsky, & Veraksa, 2016; Bjorkstrand, & Jern, 2013; Cooke et al.; Veraksa et al., 2014). In studies conducted on mature athletes, it has been shown that the use of mental imagery can increase the efficiency of learning new motor skills and improve exercise techniques. These motor skills include the process of self-learning, for example, in golf (Bell et al., 2009) or high jump (Olsson et al., 2008), and the ability to predict the actions of a partner, for example, in tennis (Robin et al., 2007). In addition, it has been shown in a number of studies that the combination of physical activity and MIM is more conducive to efficient movement performance than just motor training (Malouin et al., 2009), and that MIM can increase the strength of the lower leg, abs, arms, calves, etc. (Reiser et al., 2011). It has also been demonstrated that professional athletes use mental imagery more frequently and regularly during training (Arvinen-Barrow et al., 2007).

There are a lot of studies that demonstrate the importance of MIM for training young athletes. For example, the research of M. Guerrero and colleagues (Guerrero et al., 2015), conducted with children 8 to 14 years old, showed that through imagery, it is possible not only to achieve improvement in the performance of sports tasks, but also to increase the efficiency of a team. A study by M. Afrouzeh and colleagues (Afrouzeh et al., 2013) conducted on 36 young volleyball players ( $M_{\text{age}} = 13$  years) investigated the effects of a 7-week PETTLEP model. The participants were divided into three groups: the first group engaged in 15 minutes of mental imagery of their movements using the PETTLEP model before training three times a week; the second group practiced 15 minutes of traditional movement imagery before training three times a week; and the third group (control) did not practice any mental imagery

before training. The results showed that the athletes who practiced pitching while applying the PETTLEP model mastered the skill better than athletes in the second and control groups. There were also significant differences between the second and third groups: athletes who used traditional mental representation learned the pitching technique better than athletes who did not use any mental imagery before training.

To identify the most effective and frequently used mental images and ways of their representation by young athletes, our Canadian colleagues developed the Movement Imagery Questionnaire for Children (MIQ-C).

The MIQ-C (Martini et al., 2016) is a modification of the third version of the Movement Imagery Questionnaire (MIQ-3). It was designed for children aged 7 to 12 years, the period when a child begins to develop a mental image of what is involved in their movements.

Due to the fact that there is no Russian-language method for assessing children's ability to get a mental image of their movements, we considered it relevant to test the MIQ-C method on a Russian sample of young athletes.

The main objectives of our work were: 1) to translate the MIQ-C into Russian and to conduct the first adaptation of it; 2) to conduct the main adaptation of the MIQ-C on the sample of 112 Russian athletes; 3) to analyze the results and compare them with the Canadian study.

## Methods

The validation consisted of two stages, preliminary and main.

In the preliminary stage, the MIQ-C methodology was translated into Russian and adapted for five athletes (3 girls and 2 boys) age 7 to 12 years old, who were involved in such sports as orienteering (2), table tennis (1), volleyball (1), and acrobatics (1). As a result, some words were replaced with words that are more understandable for a Russian sample but do not distort the meaning of the task: for example, the phrase "glass of mud" was replaced with "a glass with cloudy water." In addition, a more detailed description of what "kinesthetic representation" means was added.

In the main stage, young athletes performed the tasks of the MIQ-C. It consists of four exercises. Each exercise is aimed at the work of a certain muscle group.

*The task.* Standing in the initial position (the initial positions differ in the four exercises), the child should imagine a certain movement without actually performing it, and then assess the difficulty of the mental representation of this movement on a 7-point scale (from 1 = "very difficult" to 7 = "very easy"). Each movement should be represented in three different ways: from the first person perspective (perception of the movement from a position that actualizes the result of direct interaction with specific properties of the environment [Kaminsky, & Veraksa, 2016]); from the third person perspective (perception of the movement from a position which reflects the individual's consciousness of himself as part of objective reality (Kaminsky, & Veraksa, 2016)); and kinesthetically (perception of muscle activity).

Before the testing, each child was given a detailed discussion of the instructions, as well as a practice session, during which the athlete answered questions about his or her own ways of representing this movement using the example of a mental representation of kicking a football. Also, the rules for scoring the sensation were explained by

using pictures of glasses filled with different liquids, with varying degrees of transparency. For example, if the child presented the image of kicking the ball as if looking through a glass of cloudy water, he/she should choose a value from 1 to 3 (*i.e.*, from “very difficult” to “a bit difficult”).

Sample: 112 athletes from Moscow and the Moscow region age 7 to 12 years old ( $M = 9.47$ ;  $SD = 1.34$ ) participated in the study: 70 boys and 42 girls. They were from both individual and team sports: handball (38), volleyball (30), swimming (13), sambo (7), wrestling (15), and tennis (9).

**Results**

To verify the reliability-consistency of the MIQ-C questions, the Cronbach’s alpha coefficient was estimated. The coefficient of 0.918 indicated a good consistency of the questions.

Table 1

*Measures of mental imagery of movements in Russian and Canadian samples*

Gender	Age (in years)	Russian sample				Canadian sample			
		Min	Max	MD	SD	Min	Max	MD	SD
<b>first-person imagery perspective</b>									
Female	7-8	5.25	6.00	5.63	0.53	4.67	5.28	4.97	0.99
	9-10	3.25	7.00	5.92	1.38	4.97	5.62	5.30	0.99
	11-12	2.00	7.00	6.20	1.10	4.40	4.89	5.20	1.04
Male	7-8	3.25	7.00	6.11	1.56	4.64	5.41	5.03	0.98
	9-10	4.00	7.00	6.26	0.79	4.75	5.61	5.18	0.98
	11-12	1.00	7.00	6.00	1.31	5.05	5.80	5.42	1.12
<b>third-person imagery perspective</b>									
Female	7-8	5.25	6.00	5.63	0.53	5.36	5.92	5.64	1.00
	9-10	3.25	7.00	5.92	1.38	5.65	6.25	5.95	0.69
	11-12	2.00	7.00	6.20	1.10	5.23	5.79	5.51	1.13
Male	7-8	3.25	7.00	6.11	1.56	5.06	5.76	5.41	0.97
	9-10	4.00	7.00	6.26	0.79	5.56	6.35	5.96	0.55
	11-12	1.00	7.00	6.00	1.31	5.37	6.06	5.72	0.97
<b>kinesthetic imagery</b>									
Female	7-8	3.25	6.50	4.88	2.30	4.40	5.04	4.72	0.99
	9-10	2.75	7.00	5.86	1.25	4.35	5.04	4.70	1.41
	11-12	1.00	7.00	5.29	1.57	4.90	5.21	4.90	1.01
Male	7-8	1.00	7.00	5.59	2.06	4.36	5.16	4.76	0.94
	9-10	3.75	7.00	5.94	0.88	4.24	5.15	4.69	0.94
	11-12	1.00	7.00	5.66	1.23	4.49	5.28	4.89	1.02



The results obtained for both the Russian and Canadian samples are given in *Table 1*. The scores for the Russian sample were generally higher than those obtained for the Canadian sample. For example, the mean scores of first-person MIM in our study ranged from 5.75 to 6.41; in the Canadian sample, from 4.97 to 5.42. The scores of the third-person MIM in the Russian sample ranged from 5.63 to 6.26; in the Canadian sample, from 5.41 to 5.96. The scores related to the representation of muscle movements in our study ranged from 4.88 to 5.94; in the Canadian sample they ranged from 4.69 to 4.90.

There were no significant differences by gender and age in either sample.

To test the hypothesis that mental representation of muscle activity (kinesthetic imagery) will be more difficult for children than first- or third-person perspective imagery, we used the ANOVA method.

According to the results, our hypothesis was confirmed. Kinesthetic representation had the lowest scores compared to the first- and third-person perspective imagery, regardless of the age of the children. The highest scores of MIM for all modalities (first person, third person, and kinesthetic imagery) were observed in children aged 9–10.

## Discussion

After the primary validation of the Movement Imagery Questionnaire for Children, we tested its reliability-consistency. The MIM scores of Russian and Canadian children involved in sports were compared. In both the Canadian and Russian studies, kinesthetic imagery scores were lower than first- and third-person representations. But generally, it can be concluded that Russian children athletes rated their MIM ability higher than the Canadian children did. There may be a few reasons for this. First, Russian children may overestimate their mental representation abilities. Second, there may be a social desirability factor that causes Russian children to overestimate their scores, as they are worried that these scores may affect the coach's attitude. Thirdly, it is possible that some Russian sports schools pay attention to the formation of mental imagery in children, which contributes to the development of their MIM skill.

The study also confirmed the hypothesis that kinesthetic imagery is the most difficult type of mental imagery for children. Children generally have a less developed representation of their bodies than adults do (Nikolaeva et al., 2012). However, the period from 7 to 12 years of age is precisely the most sensitive for developing a more complete awareness of one's body schema (Gurfinkel et al., 1991). Also, at this time the development of cognitive schemas, including mental imagery ability, is being developed. It can be assumed that because of the frequent use of mental imagery of movements, young athletes begin to analyze their bodily sensations in more detail, and their kinesthetic imagery increases. Although the young athletes were quite successful in achieving first and third person perspectives of MIM, they still needed an explanation of the difference between the two types of imagery, unlike mature athletes for whom this is not an issue.

## Conclusion

The reliability of the Russian version of the Movement Imagery Questionnaire for Children (MIQ-C) was tested on a sample of 112 young athletes and compared with Canadian results. The assumption that kinesthetic representations of muscle activity would be more difficult for children than first- and third-person perspective imagery was confirmed. Despite the fact that no significant differences by gender and age were found, the highest rates of ability to use all three modes of MIM were observed in children age 9–10 years. This may be due to the greater predisposition at this age to form cognitive schemas and begin using them. This assumption requires further verification.

## Limitations

It is necessary to expand the sample by choosing athletes from those sports that were not represented at this stage of the study, and to test the validity of the Russian version of the Movement Imagery Questionnaire for Children on that expanded sample.

## Ethics Statement

The study and consent procedures were approved by the Ethics Committee of Faculty of Psychology at Lomonosov Moscow State University (Approval No: 2017/735). The parents of all children who participated in the study gave informed consent for them to participate.

## Author Contributions

A.V. designed and directed the project, and developed the theoretical framework; A.Y. performed the experiments, performed the analysis, drafted the manuscript, and designed the figures; and A.V. and A.Y. aided in interpreting the results and worked on the manuscript. Both authors discussed the results and contributed to the final manuscript.

## Conflict of Interest

The authors declare no conflict of interest.

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