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Being a top swimmer during the early career is not a prerequisite for success: A study on sprinter strokes

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Keywords

Transition rateJunior-to-seniorTalent identificationCareer trajectoriesDevelopment programmes.

ABSTRACT

Objectives

To quantify the junior-to-senior successful transition rate in sprint swimming events in elite European performers.

Design

Retrospective analysis of publicly available competition data collected between 2004 and 2019.

Methods

The yearly performance of 6631 European swimmers (females = 41.8% of the sample) competing in 50 and 100 m freestyle, backstroke, breaststroke, and butterfly were included in the analysis. The junior-to-senior transition rate was determined as the number of elite junior athletes who maintained their elite status in adulthood. To investigate how the definition of elite may affect the calculation of the transition rate, we operationally defined elite athletes as those ranked in the all-time top 10, 25, 50, and 100 in their category. We also calculated the correlation between junior and senior performances.

Results
The average transition rates ranged, depending on the age of reference, from 10 to 26% in males and from 23 to 33% in females. The transition rate for the top 100 junior swimmers was greater than that for the top 10 swimmers. In general, swimmers who swam 50 m showed a slightly lower transition rate compared with those that swam 100 m. Depending on the age of reference, low-to-moderate correlations were observed between junior and senior peak performances.

Conclusions
Most elite junior athletes did not maintain the elite level in adulthood. Except for athletes in the last year of the junior category (18 years for males and 17 years for females), junior performances were poorly correlated with senior performances.

Practical implication

- Considering that approximately two-thirds of elite senior swimmers did not reach the elite level during their junior career but rather were considered sub-elite swimmers, it is possible to suggest that talent identification and development programmes dealing with young adolescents should consider alternatives to performance as the main selection criterion.
- Talent identification policies should put in place strategies to favour retention of athletes who may not be performing at the elite level in junior categories, possibly assessing growth and maturation as well as biological development status as part of a comprehensive evaluation.
- Federations can use the present findings to provide coaches, parents and athletes with realistic data on the long-term potential of and challenges for early successful athletes and benchmark their policies and performance developments.

1. INTRODUCTION

Longitudinal assessments of athlete career trajectories may provide useful data for assisting athletes, coaches, and federations in determining realistic long-term performance goals and for better informing talent development policies[1-4]. For this purpose, different studies have provided information about the career development of swimmers, focusing on relatively small samples.[1,2,5] Allen et al.[2] studied the career performances of 16 swimmers competing in the Beijing and London Olympic Games. They reported that men reached peak performance later (~24 years of age) than women (~22 years of age), despite having a similar peak performance window (~3 years) and a similar performance improvement over eight years before reaching their peak performance (~9.5%). Similarly, Costa et al.[6] described the career of junior Portuguese male swimmers for short-course freestyle events, reporting an overall performance improvement of approximately 14–19% between the ages of 12 and 18 years. More recently, using a retrospective design, Post et al.[1] showed that top-elite swimmers progressively outperformed swimmers of a similar age, with some considerable variabilities in the individual pathways and some marked gender differences, with females being early developers. The age at first appearance in the top-elite rank was widely distributed and dependent on gender, as it was from 17 to 24 years for males and from 14 to 24 years for females. Female swimmers also reached their peak performance[7] and top-level ranking earlier than males.[1]

These initial attempts to describe and predict performance in the literature suggest that the transition phase from junior to senior competitions is not as predictable as expected.[1,8] For example, Costa et al.[6] noted that the ability to predict adult performance was not reasonably robust before the age of 16 years in their cohort. Staub et al.[8] demonstrated that only one-third of the top ranked 11-year-old German swimmers were still ranked in the top 100 at 18 years of age. Sokolovas et al.[9] reported that only about half of USA swimmers considered elite at age 17–18 had been elite when they were 15–16 years old. To provide further arguments for the inability of swimmers to maintain a relative rank across a career, Yustres et al.[5] reported that only about 17% of swimming finalists in the Junior World Championship had achieved subsequent success in the Senior World Championship. The same group of researchers indicated that, amongst those who participated in both the Junior and Senior World Championships, the qualification for a final in the Junior Championships did not predict achieving success in the Federation Internationale de Natation (FINA) World Championships.[5] Despite these findings, the importance of early junior performances on future senior success cannot and should not be ruled out.[1,5,10]

The reasons for the long-term instability of performances are manifold.[11] The low association between junior and senior performance is influenced by age-related changes in three main domains: the task, the performer, and the environment.[11] Regarding the task domain, for example, the relative influence of different predictors of task performance may vary with age. Regarding the performer domain, it is known that there is considerable inter-individual variability in the timing of biological maturation.[12] Lastly, regarding the environment domain, some coaching structures, experiences and training paradigms may be favourable for early success and detrimental for later success.[13] Whilst it is challenging to determine the causes of long-term instability of performance without access to physiological, biological and training load-related data, the analysis and quantification of the junior-to-senior transition rate informs the prevalence of elite junior athletes who achieve an elite level in the senior category. Quantitatively analysing the junior-to-senior transition rate may help set realistic expectations about the chance of success in adulthood for junior athletes with early success. It may also provide information about the efficacy of early talent identification and talent promotion programmes and help coaches and parents put performances into a wider context. The junior-to-senior transition rate has been previously studied by adopting a prospective design for swimmers participating in the Junior World Championship[5,14] or the Junior National Championship.[8,9] Nevertheless, we believe that adopting both prospective and retrospective designs for the analysis of performance development is necessary to assess the transition rate with an adequate level of confidence.[15] Moreover, studying a broader sample of athletes would provide a more robust estimate and a more realistic analysis of career development to better understand the importance of success at an early age to an individual's senior career. With this approach, it is possible to consider not only the athletes who participated in the World Championships but also those unable to join because of the selection policies of the national federation or because of injuries. Similar attempts have been recently suggested for track and field eventsents[15-17], but to date, to the best of our knowledge, no study has investigated junior-to-senior transition rates in swimmers in such a way.

Additionally, the definition of an elite athlete is lacking, with descriptions ranging from Olympic gold medallists and world record holders to regional-level athletes.[18] The definition of an elite athlete in a given discipline may affect the quantification of the transition rate, as the level of competitiveness intrinsic in that definition may make the maintenance of that level throughout the career either more accessible or more difficult. Nevertheless, to date, there is no clear information on the typical junior-to-senior transition in swimming when considering different criteria to identify elite athletes. For this reason, we decided to explore how setting different criteria of the level of competitiveness (i.e., the top 10, 25, 50, or 100 swimmers) may impact transition rate estimation.

Considering the lack of analyses and limited reports on transition rate in swimmers, we focused on long-course sprint events (i.e., 50 m and 100 m) including the four strokes (i.e., freestyle, backstroke, breaststroke, and butterfly). Thus, our aim was to quantify the successful junior-to-senior transition rates of European performers in sprint swimming events taking into account 1) gender differences; 2) the use of different criteria for identifying top swimmers (i.e., the top 10, 25, 50, or 100 swimmers); 3) the reference age (i.e., from 14/15- to 17/18-year-olds); and 4) possible differences in transition rates for different strokes and distances. Furthermore, to avoid defining success only as a categorical variable (e.g., ranked in the top 50 vs ranked below the top 50), we also calculated the correlation between junior and senior performances to quantify the extent to which individual differences in junior performance predicted individual differences in senior peak performance.

2. METHODS

This study was conducted with available resources collected from the public site of Swimrankings (https://www.swimrankings.net/) for the competition years 2004–2019. This site is provided by the European Swimming Federation (LEN, Ligue Européenne de Natation) and contains an annual ranking for swimming events. The annual ranking was provided for both the junior and senior categories. Swimmers ages up to 17 years for females and up to 18 years in for males were ranked for the junior category. In contrast, in the senior category, it was possible to find swimmers aged over 17 or 18 years depending on gender. This age-related difference in category cut-off arises from the FINA rule (http://www.fina.org/content/fina-rules) and corresponds to the cut-off age for the transition to junior and senior competitions. Moreover, for each swimmer, the site provides an individual athlete profile with data on career progression (i.e., performance times throughout the career). Since the data are based on publicly available resources, no informed consent was obtained. All performance times in the database were registered in accordance with official FINA rules. The study was conducted according to the Declaration of Helsinki and was approved by the Local Ethics Committee of the University of Torino.

The names of swimmers competing in long-course sprint events (i.e., 50 m to 100 m) who were ranked in the official top 50 lists for the junior and senior categories each year were extracted for analysis. After screening the database for participant duplication, the seasonal best times (SBTs) of each swimmer's career were downloaded and included in the dataset. Owing to the uncertainty involved in forecasting when the best performance peak occurred amongst younger swimmers who subsequently did not reach the senior level, the first screening excluded all swimmers that registered their best personal performance in the last 3 years of the calendar age (i.e., from 2017 to 2019).[7] Indeed, using this cut-off, we are confident that most swimmers had achieved their individual career peak performance. Moreover, only swimmers who achieved a minimum of three SBTs (also in non-consecutive years) were included in the analysis. SBTs achieved between the ages of 10 years and 36 years or the age at career termination or as of December 31, 2019 if the individual was still competing were collected. A total of 6786 European swimmers (42% female) were included in the data analysis, with an average of 8.3 ± 3.2 and 8.2 ± 3.0 observations per male and female swimmer, respectively. Data from freestyle, backstroke, breaststroke, and butterfly competitions were included.

Statistical analysis

In order to compare junior-to-senior transition rate of swimmers of multiple generations also competing with different FINA rules (e.g., the use of full-body polyurethane swimsuits), we normalized all SBTs according to the best times of that relative year (BTY), using the following formula[1,19] :

$$rSBT = (SBT\ BTY) \text{ X } 100$$

An rSBT of 100 corresponded to the best performance of that relative year. Subsequently, for each competitive age, an all-time ranking was calculated. According to the FINA rules, we calculated all-time rankings for swimmers between ages 15 and 18 years for males and between ages 14 and 17 years for females (i.e., junior category swimmers). Similarly, all-time rankings for swimmer over the ages 18 and 17 years for males and females, respectively, were calculated for the senior category.

To address the first and second aims of the study, we calculated how many top 10-, 25-, 50-, and 100-ranked junior swimmers remained at the same top level in the senior category (>18 years old). To give a broad view of the transition rate, for this analysis, we merged data for different strokes and distances. A separate analysis was performed to assess gender differences.

For the third aim of the study, according to previous studies,[6,16,17] we defined the top 50 as the threshold reference. Thus, we calculated how many swimmers who ranked in the top 50 during their junior career remained in the top 50 in the senior category. To give a broad view, for this analysis, we merged data considering the total transition rate from 15 to 18 years of age or from 14 to 17 years of age. Separate analyses were performed for different strokes, distances, and genders.

Finally, Pearson's product-moment correlation coefficients between the peak senior performance and junior annual peak performance for swimmers of each age of the junior category were determined to assess the stability of the data. The stability was considered to be high if $r \geq 0.60$, moderate if $0.30 \leq r < 0.60$, and low if $r < 0.30$.[6] The percentages of the transition rate were calculated and reported with binomial confidence intervals (90% CIs). The significance level for the Pearson's product-moment correlation coefficients was set at $p < 0.05$. All data were analysed with custom-written software in MATLAB R2020b (Mathworks, Natick, Massachusetts), and the graphs were prepared with GraphPad Prism 8 (San Diego, CA, USA).

3. RESULTS

A total of 6786 European swimmers (female 42%) were included in the study. The junior-to-senior transition rates are presented in Fig. 1. The transition rate was overall quite low; however, it was higher for females. Taking the top 50 swimmers as a reference, on average, merging data from different junior ages and strokes, the transition rate was 21% and 25% for males and females, respectively. The transition rate increased according to reference age: the greater the reference age, the higher the transition rate (see Fig. 1). For males, using the most competitive criterion for defining top-level swimmers, i.e., top 10, resulted in the lowest transition (i.e., average merging junior age = 10%). The transition rate for the least competitive criteria (i.e., top 100) ranged from 14 to 26%. For females, the transition rate was on average 23–33%, irrespective of the criterion used to define top-level swimmers (i.e., from top 10 to top 100).

Overall, the transition rates varied slightly across distances. In fact, except for male freestyle, swimmers who swam 50-m showed a lower transition rate than those who swam 100-m. For more details, see Fig. 2.

The results of the correlation analysis and the relative 95% CI between senior and junior peak performances are reported in Table 1. The analysis indicates an increase in correlation coefficients as age increases. In general, moderate stability was observed only at the end of the junior career, i.e., at ages 18 and 17 years for males and females, respectively. Specifically, 0 to 1% of male performances at the senior level were explained by performance at age 15 years, 0 to 4% were explained by performance at age 16 years, 1 to 10% were explained by performance at age 17 years, and 2 to 16% were explained by performance at 18 years of age. For females, 0 to 6% of performances were explained by performance at age 14 years, 0 to 5% were explained by performance at age 15 years, 0 to 9% were explained by performance at age 16 years, and 6 to 19% were explained by performance at 17 years of age.

4. DISCUSSION

The present study aimed to investigate the junior-to-senior transition rates of European swimmers competing in sprint events. We operationally defined the junior-to-senior transition rate as the percentage of athletes ranked in the all-time top 50 during both their youth and adult careers. This approach has allowed us to obtain a relevant measure of how success at an early age can be predictive of later success. The main findings of this study were the following: 1) on average, ~21% and 25% of male and female top 50 swimmers, respectively, managed to succeed both in their junior and senior careers; 2) generally, changing the criterion to define elite athletes slightly changed the transition rate for males but not females; 3) the transition rate increased according to reference age; 4) the differences in transition rate across strokes were only minor; and 5) the correlations between junior and senior performances were poor to moderate.

Only 21–25% of the top 50 junior swimmers maintained the same level of competitiveness later in their careers. This finding together with the low-to-moderate correlations between junior and senior peak performances for all strokes and distances confirms the notion that early performances are not a reliable predictor for future careers.[6,8,20] The junior-to-senior transition rate observed in the present study was in line with previous national data,[8,9] but higher than that reported by studies on international swimmers[14] and track and field athletes[15-17]. Sokolovas et al.[9] reported that only about half of national USA swimmers considered elite at the end of their junior career had been elite at the beginning of the this career. A study on German swimmers showed that 23% of top athletes at age 11 years of age maintained the top-level rank until age 19 years, indicating that success at an early age is challenging to retain post-adolescence. Additionally, Yusters et al.[14] observed that only 17% of swimmers were finalists in both the Junior and Senior World Championships. Nevertheless, it is necessary to take into account that our transition rates are based on all-time top rankings and not on annual top rankings, as in previous studies. On the other hand, our results suggested that more swimmers were able to reach and/or retain elite performances both in junior and senior stages of career than world-class track and field athletes (i.e., sprinters,[15] jumpers,[17] and throwers[16]). It is possible that the lower competitive level of our database (continental vs. world level) explains this difference. In fact, to support this statement, if we focused on the transition rate in the top 10 swimmers only, the average transition rates in our sample were similar to those in previous studies (i.e., ~10% and 23% for males and females, respectively).

In general, female swimmers showed a greater junior-to-senior transition rate. This means that a higher number of young female swimmers were able to maintain a high level of performance in adulthood. Considering that top-level Olympic female swimmers achieve peak performance ~2 years earlier than top-level Olympic male swimmers[7] and that most of the female top-elite swimmers achieve the top-elite level about 3 years earlier than male top-elite swimmers,[1] it is possible to speculate a shift forward of about 2–3 years in the prediction of the transition rate for male compared to female swimmers. Thus, the gender difference might diminish or completely disappear if the gender difference in peak performance is considered. Moreover, it is also possible to speculate that earlier maturation of young females[12] at the junior ages makes them more physically similar to senior athletes, which might increase their chances for a successful transition to the senior category.

Younger swimmers showed a larger uncertainty in performance progression.[6,8] In fact, the correlation between the performance recorded in the first year of the junior category and the peak performance reached at the senior level did not exceed $r = 0.24$ (Table 1). This means that individual performance differences through junior age are not predictive of senior performances. In fact, the transition rate calculated at the beginning of the junior career was very low, i.e., <10%. When performance in the last year of the junior category was analysed, the transition rate was 35%, and the correlation between junior and senior performance was moderate (up to $r = 0.43$). This confirms that most elite senior swimmers outperformed swimmers who achieved early success after their junior career was over. Consequently, a talent-identification and -developmental programme should be wary of considering performance at a very young age and/or success as the main (or only) criterion for selection.[21] Previous work that focused on the prediction between performances from childhood to the beginning of senior career found a poor correlation between performances at ages 12 and 18 years ($r = 0.31$ and $r = -0.62$ for 50-m and 100-m freestyle, respectively), and the performance prediction was only robust at age 16 years ($r = 0.75$ and $r = 0.68$ for 50-m and 100-m freestyle, respectively).[6]

The transition rate slightly decreased when criteria that identified fewer athletes as elite (e.g., top 10) was used compared to when a lower level of competitiveness was considered. The difference was ~16% for males and 10% in females, respectively. A higher level of competitiveness may increase the instability of performance across careers for many reasons. For example, at a higher level of competitiveness, early-maturing athletes may be particularly advantaged in their junior careers compared to their senior careers. Moreover, exceptionally high senior performance may only be achieved with longer career duration, with a longer time gap between junior and senior peak performance.

Transition rates amongst disciplines are sparse and may differ amongst strokes. However, the general trend from analysis of European data suggests that the transition rate is lower for 50-m competitions than 100-m competitions. Presumably, this pattern amongst differences distance and strokes may be explained by heterogeneity of performances and thereby may account for their long-term differential stability. However, these are just speculations that have to be confirmed by future studies, possibly with larger datasets. Nevertheless, 50-m freestyle showed the lowest transition rate, possibly because speed is strongly affected by growth and maturation[22,23] and, therefore, early success may be linked to earlier maturation. Another possible explanation is that the freestyle stroke is the only 50-m event in the Olympic programme. Therefore, it is possible to speculate that a higher level of competitiveness may in part explain these results.

In summary, our results suggest that the populations of successful juniors and seniors are not identical, but rather are widely distinct populations. Indeed, many successful junior swimmers (i.e., athletes ranked in the all-time top 50 during their youth career) did not reach the elite level in their senior career. This evidence suggests that the most successful senior swimmers (i.e., athletes ranked in the all-time top 50 during their senior career) were not successful when they were juniors, and therefore, they were considered junior sub-elite swimmers. Moreover, data confirm that predicting senior performance from youth performance may be problematic and prone to large error and that talent identification cannot consider only actual performance as the main parameter to select or not select swimmers. Different possible explanations may explain these results. The junior-to-senior transition is a challenging process associated with diverse demands[24]: Some athletes may cope well with them, whilst others may not. Many years of training and experience are necessary to compete at the highest level in the international arena.[2,25] Competing at a high level during the early phase of one's career may provide specific skill acquisition and experiences to help improve chances for success in later stages of the career.[5,26] Nevertheless, even if some degree of sports specialization is necessary to develop elite-level skill development,[5,14] a large training volume in a single sport can be deleterious.[13] Instead, early diversification seems to positively impact performance improvement to optimize success whilst reducing the incidence of overuse injury, psychological stress, dropout and burnout[27-29]. In this regard, it has been reported that many successful senior athletes focus not only on their dominant sport but also on other sports or disciplines during their early careers, taking part in both training sessions and competitions.[11,30,31] These athletes also enter age-group rankings later.[30] The large turnover/dropout may also be explained by maturity selection bias and a relative age effect. Maturing earlier and being relatively older may be advantages for success at earlier ages, but these effects tend to disappear later in life.[11,32-34]. In this regard, it has been suggested that level of maturity may be able to predict both a swimmer's technical skill and related performance,[35] highlighting the need to account for the level of maturity in talent identification programmes. With easier access to competition databases, it is becoming easier to study junior-to-senior transition rates of different sports. This initial attempt in swimming is limited as it only analysed sprint events and European athletes. However, considering the sample size of >6000 swimmers, we expanded the previous literature and provided a starting point to verify whether similar patterns are evident in other continents and in other swimming events. Moreover, we tracked career patterns from data available in only one database. Consequently, it is possible that some swimmers may have started their careers before appearing in this database, possibly having competed in lower-level national competitions. This may have partially impacted our results.

5. CONCLUSION

The junior-to-senior transition rate amongst elite European swimming sprinters was as low as 21% and 25% for males and females, respectively. The present findings provide evidence that many successful junior swimmers do not reach the elite level in the senior category and indicate that, except for athletes in the last year of the junior category (i.e., 18 years for males and 17 years for females, respectively), junior performance is poorly correlated with senior performance. Indeed, most elite junior athletes were not able to maintain the same level of competitiveness in their senior careers. However, successful female junior swimmers have a slightly better chance of becoming elite senior athletes. This is true independent of the competitiveness criteria used to define the elite level, which ranged from the top 100-ranked to top 10-ranked athletes.

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Declaration of interest statement

The authors declare no conflict of interest.

Confirmation of ethical compliance

The study was conducted according to the declaration of Helsinki and was approved by the local ethics committee of the University of Torino. The authors also declare that the study was conducted following all ethical compliances.

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Fig. 1. The transition rates (merged across stroke and distance) at different criteria to define top-level and reference age. The panel shows how many swimmers who were ranked top 10, 25, 50,100 at ages 15, 16, 17, and 18 years for males and at ages 14, 15, 16, and 17 years for females preserved their status in their senior careers.

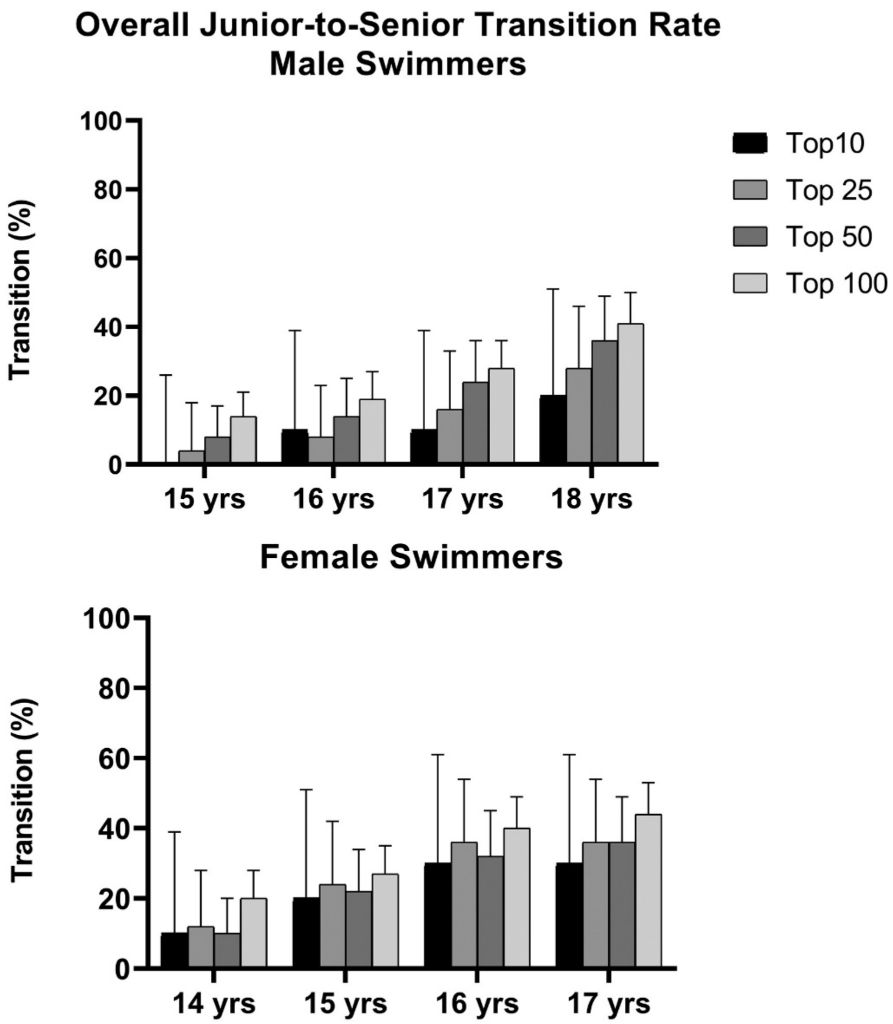

Fig. 2. The transition rates of the top 50-ranked swimmers in their whole junior careers who managed to become top 50 ranked during their senior careers. The data are presented separately for different strokes, distances, and gender.

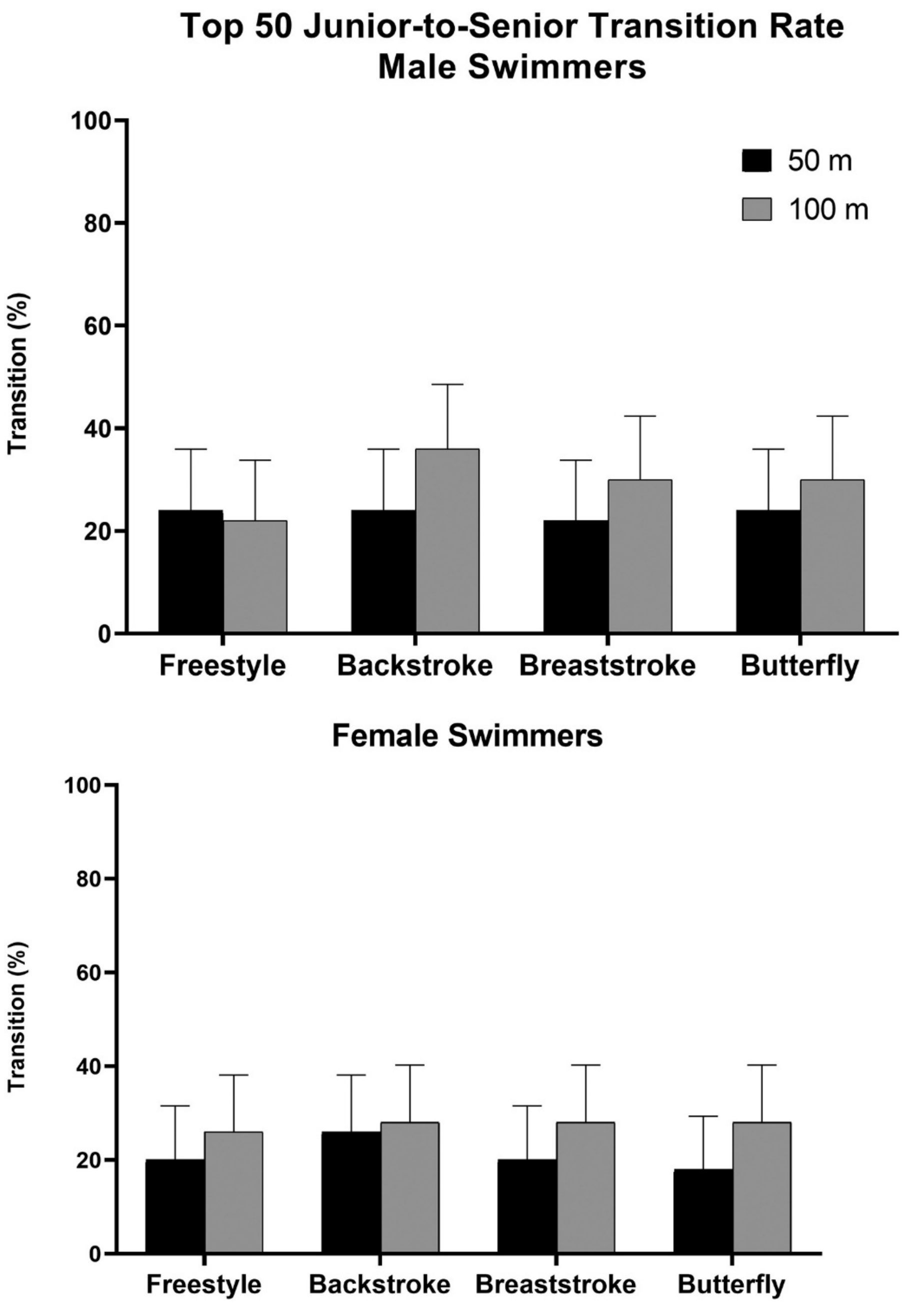

Table 1. Correlation results between senior peak performance and junior peak performance at difference ages.

Male swimmers	15 years		16 years		17 years		18 years	
	N	r [95% CI]	N	r [95% CI]	N	r [95% CI]	N	r [95% CI]
50 m freestyle	304	0.02 [−0.10, 0.13]	430	0.15 [0.05, 0.24]	535	0.25 [0.17, 0.33]	606	0.29 [0.22, 0.37]
100 m freestyle	332	0.10 [−0.01, 0.21]	465	0.21 [0.12, 0.30]	592	0.18 [0.10, 0.26]	674	0.36 [0.29, 0.42]
50 m backstroke	126	0.07 [−0.11, 0.24]	182	0.15 [0.01, 0.29]	281	0.21 [0.09, 0.32]	307	0.35 [0.25, 0.44]
100 m backstroke	189	0.04 [−0.11, 0.18]	242	0.16 [0.03, 0.28]	292	0.31 [0.20, 0.41]	313	0.40 [0.30, 0.49]
50 m breaststroke	129	0.09 [−0.09, 0.26]	183	−0.08 [−0.23, 0.07]	275	0.03 [−0.09, 0.15]	316	0.12 [0.00, 0.23]
100 m breaststroke	165	0.12 [−0.04, 0.27]	220	0.11 [−0.02, 0.24]	288	0.08 [−0.04, 0.19]	329	0.17 [0.06, 0.27]
50 m butterfly	116	−0.12 [−0.29, 0.07]	177	0.07 [−0.08, 0.22]	269	0.12 [0.00, 0.24]	322	0.23 [0.12, 0.33]
100 m butterfly	139	−0.02 [−0.19, 0.15]	209	0.15 [0.02, 0.28]	278	0.20 [0.08, 0.31]	318	0.28 [0.18, 0.38]

Female swimmers	14 years		15 years		16 years		17 years	
	N	r [95% CI]	N	r [95% CI]	N	r [95% CI]	N	r [95% CI]
50 m freestyle	174	0.12 [−0.03, 0.26]	221	0.15 [0.01, 0.27]	250	0.30 [0.18, 0.41]	269	0.43 [0.33, 0.53]
100 m freestyle	206	0.22 [0.09, 0.35]	226	0.22 [0.10, 0.34]	294	0.27 [0.16, 0.38]	304	0.38 [0.27, 0.47]
50 m backstroke	157	0.24 [0.09, 0.39]	232	0.13 [0.00, 0.26]	277	0.26 [0.14, 0.37]	277	0.39 [0.29, 0.49]
100 m backstroke	177	0.08 [−0.07, 0.23]	219	0.13 [−0.01, 0.25]	255	0.18 [0.06, 0.30]	259	0.42 [0.31, 0.51]
50 m breaststroke	126	0.04 [−0.14, 0.22]	224	0.02 [−0.11, 0.16]	264	0.06 [−0.07, 0.18]	276	0.24 [0.12, 0.35]
100 m breaststroke	168	0.19 [0.04, 0.34]	218	0.22 [0.08, 0.34]	256	0.20 [0.08, 0.32]	255	0.24 [0.12, 0.35]
50 m butterfly	130	0.05 [−0.13, 0.22]	201	0.17 [0.03, 0.30]	245	0.14 [0.02, 0.26]	254	0.33 [0.21, 0.44]
100 m butterfly	164	0.15 [0.00, 0.30]	214	0.20 [0.07, 0.33]	246	0.13 [0.00, 0.26]	261	0.43 [0.32, 0.52]

Notes: data are presented as r [95% CI]; N, number of swimmers entered in the analysis.