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Coaches' implicit associations between size and giftedness: implications for the relative age effect

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Abstract
The relative age effect (RAE) is a well-established phenomenon in education and sports. Coaches have been assumed to be important social agents of RAE via biased selection decisions in favour of children with maturation advantages. In the present research, we used the Implicit Association Test to investigate automatic associations between body size and a player's domain-specific giftedness amongst youth baseball ($N = 18$) and youth soccer coaches ($N = 34$). We found medium to strong automatic associations between body size and player giftedness (baseball: $M_D = 0.62$; soccer: $M_D = 0.51$). Specifically, taller players were associated with positive performance-related attributes, whereas smaller players were associated with negative attributes. The results are in line with theories of grounded cognition by showing that the abstract concept of "sport giftedness" is partly grounded in the perception of physical height amongst youth sports coaches. We argue that this grounded cognition has the potential to influence coaches' selection decisions and in turn account for RAE as coaches are biased towards physically more matured players, even when no apparent performance advantage is evident.

Keywords: *relative age effect, stereotype, person perception, grounded cognition, Implicit Association Test, social cognition*

In the educational system and organised youth sports, children are divided into groups based on their birth date, with the well-meant intention to provide equal opportunities for participation and success. A multiplicity of statistical analyses with large effects (Gladwell, 2008) in academic environments (Alton & Massey, 1998; Bedard & Dhuey, 2006) and sports (Edwards, 1994; Schorer, Wattie, & Baker, 2013) show a relative age effect (RAE) which is most likely due to the fact that children and adolescents are divided into age groups according to birth dates. For this division, there has to be a cut-off date, for example, the 1st of January. A consequence from this division process in children and youth sports is that a child, who happens to be born in January, will have a whole year of maturation advantage compared to a child born in December. In turn, this maturation advantage has the potential to lead to relatively better performance in many sports compared to a child that is almost a year younger, but nevertheless classified to the same age group (e.g. Hancock, Adler, & Côté, 2013). Indeed, research suggests that these maturation advantages within youth teams have the potential to translate to performance advantages on physical performance tests (Figueiredo, Gonçalves, Coelho, & Malina, 2009; Malina, Ribeiro, Aroso, & Cumming, 2007; Philippaerts et al., 2006) and match performance (Buchheit & Mendez-Villanueva, 2014; Gastin & Bennett, 2014) within that age cohort. Therefore, it is not surprising that there is a systematic exclusion of younger/less matured players, for example, in first youth soccer teams (Gil, Ruiz, Irazusta, Gil, & Irazusta, 2007; Gravina et al., 2008) or national teams (Buchheit et al., 2013), leading to an over-representation of selected players born in the first quarter of the selection year in plenty of sports and across various countries (e.g. Musch & Grondin, 2001). However, the under-representation of younger and physically underdeveloped players within an age group is problematic if the goal is to identify the most gifted individuals within a certain sports population (Helsen et al., 2012).

The most frequent hypothetical, albeit plausible, assumption for the occurrence of RAE is that social agents (e.g. coaches) are responsible for RAE as they are positively biased towards children with maturation advantages (Hancock et al., 2013); for example, physical properties such as body height (e.g. Helsen, Starkes, & Van Winckel, 1998) which are more

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likely to occur amongst children born relatively closer to the cut-off date compared to ones born later. According to Hancock and colleagues (2013), this bias towards children with maturation head-starts has the potential to result in Matthew (Merton, 1968) and Pygmalion effects (Rosenthal & Jacobson, 1968) via the social agents, youth coaches and athlete's parents. Due to the Matthew effect ("the rich get richer; the poor get poorer") and the Pygmalion effect (expectation from others align with the outcome), the athlete in question will be fostered more by the social agents, parents and coaches, and in turn is likely to strive to fulfil their expectations.

Currently, there is no direct evidence for this explanation, as no research exists, showing that youth coaches are in fact biased towards physically more matured players when no apparent performance advantage is evident. In this respect, theories of grounded cognition (Barsalou, 2008) are a useful theoretical framework to argue for a grounded association between perceptions of anthropometric parameters (e.g. height) and indicators of domain-specific giftedness (e.g. athletic potential). Grounded cognition theory assumes that people's mental representations of abstract concepts (e.g. giftedness) are modality-specific embodied information about space and the body (e.g. body height). Evidence for this assumption stems from research showing that people across cultures automatically interpret "up", "above", and "large" as powerful, whereas "down", "below and "small" are seen as cues for powerless (Fiske, 1992). Such grounded theorising has been derived from evolutionary psychology, arguing for a vital survival mechanism for these kinds of associations (Cawley, Joyner, & Sobal, 2006; Schuett, 1997). In this respect, empirical evidence provides support for the fact that perception of height unconsciously influence different kinds of judgements: such as fight or flight (Archer, 1988), impressions of adults (Montepare, 1995) and athletes (Masters, Poolton, & Van Der Kamp, 2010), authority (Dannenmaier & Thumin, 1964), job status (Egolf & Corder, 1991), career success (Judge & Cable, 2004), decision-making in soccer (Van Quaquebeke & Giessner, 2010) and dating (Cawley et al., 2006).

Grounded cognition theory therefore provides a solid basis for the claim that coaches use body height as a perceptual cue for an athlete's giftedness. In the present research, we utilised the Implicit Association Test (IAT; cf. Greenwald, McGhee, & Schwartz, 1998) to test whether baseball and soccer coaches' concept of an athlete's giftedness is grounded in perceptions of physical height. The IAT rests on the premise that it should be easier to make the same response (a key press) to concepts that are strongly associated to one another compared to concepts that are only weakly, or not associated and has therefore been shown to be a useful tool for assessing implicit associations between two concepts such as physical height and giftedness. In turn, this grounded cognition of youth coaches might lead to a Halo effect (Thorndike, 1920) as the perception of tall players might automatically lead to more favourable judgements (Nisbett & Wilson, 1977) of athletes and, as a consequence, bias coaches' selection decisions.

Method

Participants

One group of male baseball coaches (N = 18; M_{age} = 30.1 years; SD = 11.8 years), who had an average of 6.5 years of youth coaching experience (coaching players ranging from 12–18 years). Another group of male soccer coaches (N = 34; M_{age} = 30.7 years; SD = 7.1 years), coaching youth teams for an average of 7.3 years at an elite level took part in the study. All soccer coaches were in possession of an UEFA Coaching Licence (14 A-, 7 B- and 13 C-Licence). Also, 6 coaches were currently coaching below 10-year-olds, 16 coaches were coaching 10- to 14-year-olds, 11 coaches were coaching 14- to 17-year-olds and 2 were coaching above 17-year-olds. Seven reported to coach a special talent development team implemented by the National Football Association. Neither age nor expertise moderated the pattern of results. The study was carried out in full accordance with the Helsinki Declaration of 1975, and written informed consent was obtained from all participants. The study was approved by the Ethics Board of the German Sport University Cologne.

Materials and stimuli

In order to investigate whether a large baseball/soccer player is implicitly associated with attributes characterising a "gifted baseball/soccer player", we paired the *target concept* of player size with the *attribute dimension* of gifted vs. non-gifted baseball/soccer players, as is standard procedure when using the IAT (see Figure 1). Since initially introducing the IAT in 1998, research has provided substantial evidence concerning the psychometric properties of IAT measures in assessing implicit associations between concepts such as giftedness and player size (e.g. Greenwald, Poehlman, Uhlmann, & Banaji, 2009; Nosek, Greenwald, & Banaji, 2007). For the initial *target concept discrimination*, we selected six images from point-light videos displaying a baseball pitcher performing a pitch or six images from point-light videos of a soccer player performing a soccer skill. We chose this method to remove appearance

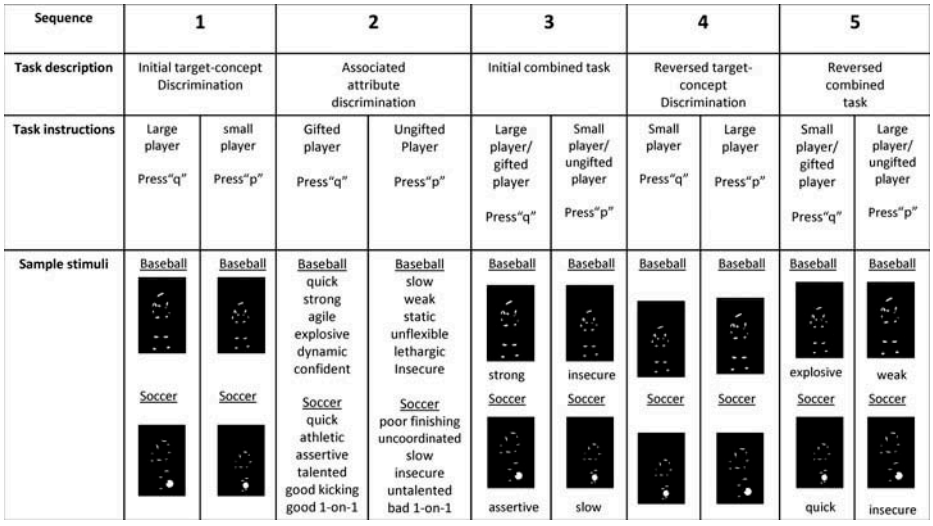

Figure 1. Schematic description and illustration of the IAT (with the sequence order congruent before incongruent) used in the study.

characteristics such as clothing from the display and, more importantly, this method allowed us to digitally enhance or decrease the size of the same player without participants being aware of this. For the large player images, we digitally increased the point-light images by 10%, whereas we decreased the size of the point-light images by 10% in the small player condition. This ensured that the presented players only differed in size as exactly the same players were presented in the large and small player condition. Hence, we had 12 different stimuli depicting the same baseball/soccer player in 6 point-light stills enlarged by 10% in the large category and decreased in size by 10% in the small category. For the *associated attribute discrimination*, we initially asked a soccer and baseball expert, teaching coaching courses in the respective sports at the local university, to create two lists consisting of 10 attributes being either associated with a gifted youth baseball/soccer player and 10 attributes with a non-gifted baseball/soccer player. In a second step, two different independent baseball experts or two independent soccer experts (in possession of a high coaching licence) rated this list of attributes as being either characteristic of a gifted youth player or of a non-gifted youth player on a Likert scale ranging from 1 "very characteristic of a ungifted player" to 7 "very characteristic of a gifted player". Following the expert ratings, we produced a list of 12 attributes that were rated highest as being characteristic of a gifted or ungifted baseball player and 12 as being rated highest for a gifted or ungifted soccer player. The final two lists consisted of six attributes associated with a gifted player ($M_{baseball}$ = 6.25; SD = .42; M_{soccer} = 6.42; SD = .49 and six with a non-gifted player ($M_{baseball}$ = 1.42; SD = .38; M_{soccer} = 1.67; SD = .51; see Figure 1).

Procedure

All participants were seated individually in front of a standard 15 inch notebook computer and provided all their responses via a computer keyboard. Participants were informed that the experiment involved a simple response time test. They were asked to classify images and words as quickly and as accurately as possible (cf. Figure 1) and were blind to the actual purpose of the experiment. The procedure used was similar to Greenwald et al. (1998) and consisted of five blocks of trials. The first experimental block (block 3) combined the stimuli from the concept category (large player /small player) with the attribute category (gifted player/ ungifted player), whilst the second experimental block (block 5) reversed this combination (cf. Figure 1, fifth column). Blocks 1, 2 and 4 were practice blocks for participants to learn the associations between the different stimuli and the respective keys. Depending on the experimental condition, the first experimental block was either congruent concerning our hypothesis (i.e. large player images paired with gifted player attributes, and small player images paired with ungifted player attributes) and the second experimental block incongruent (i.e. large player images paired with ungifted player attributes, and small player images paired with gifted player attributes), whereas in the other experimental condition we switched this order to exclude potential order effects. In the congruent condition, player images and attributes were randomly presented one by one in the middle of the screen and participants had to press the "q" key for large player images and gifted player attributes, whereas they had to press the "p" key for small player images and ungifted player attributes. In the incongruent condition, participants

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had to press the "q" key for small player images and gifted player attributes, whereas they had to press the "p" key for large player images and ungifted player attributes (cf. Figure 1). In addition, the order of blocks 2 and 4 was changed according to the experimental condition to match the attribute categorisation of the subsequent experimental blocks 3 and 5.

If the target categories of player size are differentially associated with the attribute dimension (gifted vs. ungifted) as hypothesised, then participants will respond faster to the congruent block in comparison with the incongruent block. After completing the IAT test, participants filled out a questionnaire gathering biographic data, while further asking participants explicitly whether they thought that the size of a player would influence their judgements about that player, and what role they considered size to play in baseball/soccer: 1 = minimal role, 2 = moderate role and 3 = important role.

Data analysis

We ran a mixed design analysis of variance (ANOVA) on the response times of participants with repeated measures on the within-subject factors congruency [*congruent* (large player and gifted player attributes and small player and ungifted attributes) vs. *incongruent* (large player and ungifted player attributes; small player and gifted player attributes)], stimulus material (*player image* vs. *player attributes*), and the between-subject factors sequence order (*congruent* before *incongruent* vs. *incongruent* before *congruent*) and type of sport (baseball vs. soccer). We followed up the omnibus ANOVA with a series of dependent *t*-tests to illuminate the origin of the effects. For the main analysis regarding the comparisons of response time latencies, we further report effect size estimates and their precision in the form of 95% confidence intervals (Cumming, 2012). Furthermore, based on the procedure of Banting, Dimmock, and Lay (2009), we computed a modification of the individual difference measure *D* (Greenwald, Nosek, & Banaji, 2003) on the five-block version of the IAT to assess individual differences in automatic associations between size and giftedness. First, the algorithm eliminated all trials with response times above 10,000 ms and participants with 10% of trials under 300 ms were excluded (which was not the case in the present study). Second, the algorithm was modified so that the difference between the incongruent and congruent block was divided by the inclusive standard deviation (Banting et al., 2009). The resulting number from this equation represented an individual's implicit association between size and giftedness. We further report exploratory analysis on this *D* measure.

Results and discussion

Figure 2 displays the mean latencies and the 95% confidence intervals between the congruent block of the IAT and the incongruent block for the sport of soccer (left) and baseball (right). Response time latencies differed substantially between congruent and incongruent trials for both soccer coaches ($M_{difference}$ = 223.67 ms [141.1, 306.3], d = 0.62

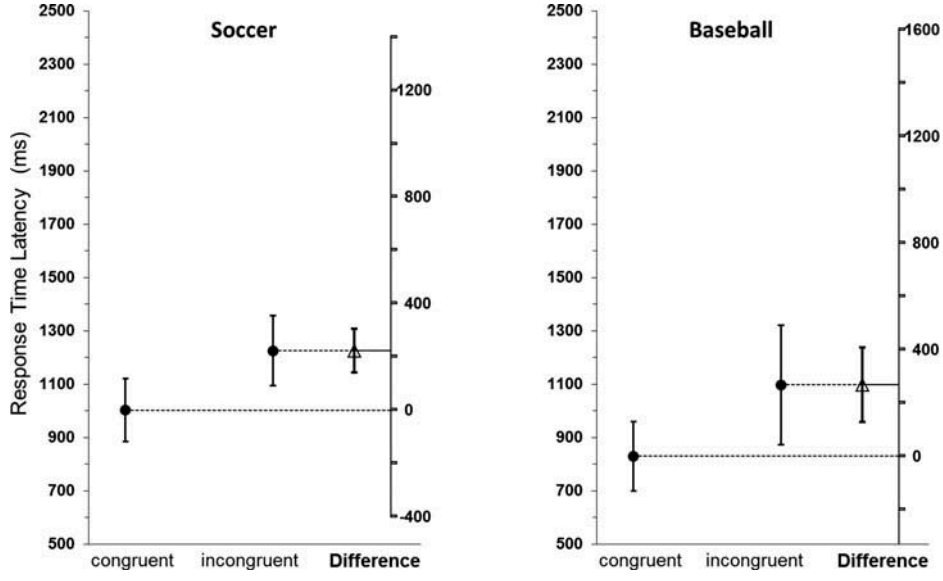

Figure 2. Mean latency results and 95% confidence intervals for the congruent trials (large player + positive attributes; small player – negative attributes) vs. the incongruent trials (small player + positive attributes; large player – negative attributes) of the 34 soccer (left panel) and 18 baseball coaches (right panel). The difference between the group means, with its 95% confidence interval, is shown on a floating difference axis at the right in each panel.

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[0.35, 0.89]) and baseball coaches ($M_{difference}$ = 268.17 ms [129.24, 407.1], d = 0.73 [0.29, 1.15]).

The mixed design ANOVA on the response times of participants only revealed a significant main effect for congruency ($F(1, 48)$ = 44.38, P = .01, η^2_p = .48). Neither the main effects for sequence order (P = 0.84, η^2_p = .01), stimulus material (P = .27, η^2_p = .25), type of sport (P = .14, η^2_p = .04) nor any of the two-way interactions reached significance (all P > .43), indicating that the IAT effect was evident across both sports and for both player attributes (congruent: M = 910.71 ms; SD = 258.57 ms vs. incongruent: M = 1074.81 ms; SD = 410.29 ms) and player images (congruent: M = 974.01 ms; SD = 443.44 ms vs. incongruent: M = 1145.35 ms; SD = 382.07 ms). These results suggest that both baseball and soccer coaches show strong implicit associations between body size and domain-specific giftedness. Follow-up dependent t-tests amongst the baseball coaches revealed significant differences between the congruent and the incongruent conditions for both the player image stimuli ($t(17)$ = −3.90, P = .01, two-tailed, d = 0.74 [0.23, 1.23]) and the player attribute stimuli ($t(17)$ = −3.36, P = .01, two-tailed, d = 0.67 [0.26, 1.10]). Follow-up dependent t-tests amongst the soccer coaches revealed significant differences between the congruent and the incongruent conditions for both the player image stimuli ($t(33)$ = −3.75, P = .01, two-tailed, d = 0.43 [0.18, 0.67]) and the player attribute stimuli ($t(33)$ = −4.8, P = .01, two-tailed, d = 0.72 [0.38, 1.05]).

To assess the influence of the individual attribute items on the observed IAT effect, we further computed a series of dependent t-tests (one-tailed) on the latencies of congruent and incongruent trials for every attribute (see Table I).

The individual difference analysis using the D statistics (Greenwald et al., 2003) confirmed the latency analysis by revealing that except for two youth baseball coaches (M_D = −0.21; SD_D = 0.21) all the coaches showed medium to strong implicit associations (M_D = 0.73; SD_D = 0.26). The same pattern emerged for the soccer coaches: Except for three soccer coaches (M_D = −0.25; SD_D = 0.26), all the coaches showed medium to strong implicit associations (M_D = 0.61; SD_D = 0.33) between size and giftedness. No differences on the D measure were evident between coaches who reported that size might have an influence on their judgments of players (N = 10 in baseball and N = 13 in soccer)

Table I. Mean response time latencies as a function of congruency for baseball and soccer coaches.

	Condition						
	Congruent		Incongruent				
	M (ms)	*SD*	*M* (ms)	*SD*	*t*	*P*	*d*
Baseball							
Agile (agil)	956.7	463.4	1062.8	289.8	−1.02	.16	.24
Dynamic (dynamisch)	778.7	237.0	1078.4	889.9	−1.46	.08	.34
Explosive (explosiv)	803.1	404.7	837.5	316.7	−.56	.29	.13
Slow (langsam)	758.2	239.0	1011.1	422.1	−2.60	.01	.61
Quick (schnell)	792.8	330.8	1146.1	633.2	−3.10	.01	.73
Weak (schwach)	852.0	606.6	928.2	604.8	−.34	.35	.09
Confident (selbstbewusst)	879.1	440.2	982.1	294.3	−.79	.22	.19
Strong (stark)	755.0	214.4	902.1	350.6	−1.64	.06	.39
Static (statisch)	876.5	236.3	1408.5	925.6	−2.69	.01	.63
Lethargic (träge)	795.8	359.6	994.8	295.1	−1.90	.04	.45
Unflexible (unbeweglich)	879.2	519.4	1068.7	546.9	−1.14	.13	.27
Insecure (unsicher)	956.7	463.4	1062.8	289.8	−1.02	.16	.24
Soccer							
Poor finishing (Abschluss-schwach)	1065.5	505.7	1458.0	725.6	−3.20	.01	.55
Athletic (athlethisch)	883.2	390.7	1140.4	505.5	−2.32	.01	.40
Assertive (duchsetzungsfähig)	1069.1	426.2	1313.3	662.5	−2.04	.03	.35
Slow (langsam)	855.9	315.0	992.0	312.9	−2.43	.01	.42
Quick (schnell)	868.5	312.1	930.1	369.6	−.78	.22	.13
Good kicking (Schuss-stark)	875.9	315.9	1114.3	406.3	−3.05	.01	.53
Talented (talentiert)	880.5	231.2	1101.1	497.9	−2.50	.01	.43
Uncoordinated (ungelenk)	968.7	439.6	1052.2	418.1	−1.25	.11	.21
Insecure (unsicher)	945.0	465.8	1177.6	574.7	−1.95	.03	.33
Untalended (untalentiert)	936.0	468.1	1265.2	841.5	−2.76	.01	.47
Good 1-on-1 (Zweikampf-stark)	1084.0	562.2	1289.8	529.4	−1.71	.05	.29
Poor 1-on-1 (Zweikampf-schwach)	1065.5	505.7	1458.0	725.6	−3.20	.01	.55

Note: German translation as used in the experiment in parentheses.

compared to coaches who did not think this (N = 8 in baseball and N = 21 in soccer; P > .50). The attained coaching licence had no influence on the implicit associations (A-licence: M_D = 0.58; SD_D = 0.42; B-licence: M_D = 0.40; SD_D = 0.31; C-licence: M_D = 0.48; SD_D = 0.49; $F(2, 31)$ = .395, P = .68, η^2_p = .03). In total, 55.6% of the baseball coaches and 55.9% of the soccer coaches rated the role of bodily composition in the respective sports to be only moderate; 38.9% of the baseball coaches and 32.4% of the soccer coaches rated the role of bodily composition in the respective sports to be important; whereas only 5.6% of the baseball coaches on 11.8% of the soccer coaches rated the role of bodily composition to be minimal. Again, these ratings were not significantly related to the implicit associations of the coaches (Spearman $r(52)$ = –.199, P = .16). Further, there was no correlation between the age group the coaches were coaching and the implicit associations (Pearson $r(52)$ = .034, P = .84).

General discussion

The goal of the present research was to provide first evidence that coaches in the sports of baseball and soccer automatically associate physical size with performance-related characteristics. Coaches across two sports (partly) ground their conceptual thinking of sport giftedness within the perception of physical height. More specifically, the findings show that both youth baseball and soccer coaches automatically associate tall players with positive performance attributes and small players with negative performance attributes.

Previous research has shown that more matured players within a certain age group oftentimes outperform less matured players (Buchheit & Mendez-Villanueva, 2014; Figueiredo et al., 2009; Gastin & Bennett, 2014; Malina et al., 2007; Philippaerts et al., 2006). Therefore, it seems reasonable for coaches to select more matured players in meeting their goal of forming teams that are currently most successful. However, the present research shows that coaches are even implicitly biased towards physically larger players when no apparent performance advantage is evident. Since physical height is not known to be a major limiting factor in baseball or soccer as, for example, in basketball or team handball, this automatic association is problematic in the process of identifying and developing the most gifted individuals within these sports.

The main finding of the present study is well aligned with theories of grounded cognition which state that humans ground their conceptual thinking within perceptual modalities (Barsalou, 2008). The IAT procedure used in this study has shown to be a useful research tool to make this theoretical claim visible, as the study demonstrated moderate to strong automatic associations between player size and attributes that are positively or negatively related to sport performance. Participants responded significantly faster when pairing either tall player images and positive attributes, or small player images and negative attributes, in comparison to pairing tall player and negative attributes, or small player and positive attributes. This finding provides evidence for the suggestion that certain characteristics of athletes (in this case height) are automatically associated with certain athlete schemas (Furley & Dicks, 2012; Furley, Dicks, Stendtke, & Memmert, 2012; Greenlees, 2007). Our results suggest that coaches hold specific stereotypes about physical size and beneficial performance characteristics. Such a grounded association of a coach could lead to a self-fulfilling prophecy (cf. Hancock et al., 2013): for example, two athletes of the same skill level that only differ in physical height might experience an entirely different treatment by their coach as the coach gives the taller athlete more playing time, more attention in practice, which in turn might lead to the striving of one player while the other one might drop out. Hence, if these automatic associations reduce the chances of players being selected who happen to be physically underdeveloped due to their birth dates, then this would substantially reduce the population to draw from in the process of identifying the most talented players. Future research is needed to establish this hypothesis and provide direct evidence that the automatic associations between physical height and positive performance characteristics bias the selection decision of youth coaches in order to assure that small players have equal chances to be fostered in talent development programmes.

Limitations

A limitation of the present study concerns the attribute lists of the experimental procedures as these did not include items tapping tactical skills, such as creativity (Memmert, 2012) or decision-making (Memmert & Furley, 2007), which are important aspects of successful performance in team sports such as soccer, but might not be associated with physical height. Therefore, future research should specify which performance-related attributes are implicitly associated with physical height and which ones are not.

A further point that warrants discussion is the fact that most of the attributes in the soccer IAT showed significant differences between the congruent and incongruent condition (Table I), whereas fewer were significant in the baseball IAT. This is most likely due to the larger sample size in the soccer condition as the response time differences between

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the congruent and incongruent condition are similar for the baseball and soccer IAT (cf. Table I).

Finally, the point-light images were created with 17- to 18-year-old soccer players and therefore did not account for the different body proportions that are evident in different age groups. However, the IAT involves discriminating between relatively larger and smaller players in order to measure how the cognitive concept or schema (Greenlees, 2007) of small and large players is implicitly associated with certain performance-related attributes. In line with previous research in sports demonstrating that certain player ethnicities (Furley & Dicks, 2014) and non-verbal behaviours (Furley, Dicks, & Memmert, 2012) are automatically associated with performance-related attributes amongst athletes and coaches, we provide first evidence that physical size is automatically associated with attributes related to sport giftedness.

Conclusion

In conclusion, research on RAE to date has almost solely focused on establishing the occurrence of RAE utilising the methodological approach of retrospective team constellation analysis. This approach has neglected to provide direct evidence for the assumed mechanisms behind RAE. In this respect, the present study provides first evidence showing that the abstract concept of "sport giftedness" is partly grounded in physical height amongst youth sport coaches. Drawing on the Matthew and Pygmalion theorising of Hancock et al. (2013), this bias has the potential to partially explain the uneven distribution of birth dates evident in the RAE. However, future research has to extend this first finding by showing that this grounded cognition biases actual behaviour amongst social agents such as sport coaches.

Disclosure statement

No potential conflict of interest was reported by the authors.

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