The Impact of the Achievement Motive on Athletic Performance in Adolescent Football Players

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Abstract

Researchers largely agree that there is a positive relationship between achievement motivation and athletic performance, which is why the achievement motive is viewed as a potential criterion for talent. However, the underlying mechanism behind this relationship remains unclear. In talent and performance models, main effect, mediator and moderator models have been suggested. A longitudinal study was carried out among 140 13-year-old football talents, using structural equation modelling to determine which model best explains how Hope for Success (HS) and Fear of Failure (FF), which are aspects of the achievement motive, motor skills and abilities affect performance. Over a period of half a year, HS can to some extent explain athletic performance, but this relationship is not mediated by the volume of training, sport-specific skills or abilities, nor is the achievement motive a moderating variable. Contrary to expectations, FF does not explain any part of performance. Aside from HS, however, motor abilities and in particular skills also predict a significant part of performance. The study confirms the widespread assumption that the development of athletic performance in football depends on multiple factors, and in particular that HS is worth watching in the medium term as a predictor of talent.

Keywords

Achievement motivation, performance, football, motor skills, moderator/mediator models

Introduction

Sports scientific talent research emphasises the significance of psychological characteristics for the successful development of promising sports talents to become successful, top-class athletes. Thereby achievement motivation is thought to play a particularly important role (e.g. Coetzee, Grobbelaar, & Gird, 2006; MacNamara, Button, & Collins, 2010). However, theoretical inquiries and empirical studies focus on the *existence* of a relationship between achievement motivation and athletic performance. The *nature* of this relationship remains unresolved. The aim of the present paper is to define this relationship in early adolescence more precisely, based on psychological theories, talent models and empirical findings, and to check it empirically in the case of football.

Relationships between achievement motivation and athletic performance

The question *whether* a positive link exists between the strength of the achievement motive and athletic performance would appear to have been adequately answered in empirical terms by means of cross-sectional (Coetzee et al. 2006; Halvari & Thomassen, 1997) and longitudinal studies (Elbe & Beckmann, 2006; Unierzyski, 2003). The positive correlation between the achievement motive and performance is attributable particularly to Hope for Success (HS), whereas Fear of Failure (FF), the second classic component of the achievement motive (Atkinson, 1957), is associated negatively with performance (Halvari & Thomassen, 1997). What remains unclear, however, is *how* the achievement motive affects athletic performance (Schorer, Baker, Lotz, & Busch, 2010). Claims about the relationship between the achievement motive and athletic performance are found either in talent models or in performance models. Talent models aim to describe the effect of talent traits on athletic performance at the age of peak performance, or on the development of performance. Performance models show how actual performance can be explained. Therefore it makes sense to investigate these models in terms of the relationship they postulate between the achievement motive and athletic performance. Based on this, the deduced mechanisms should be examined empirically.

In addition to direct effects, in which the dependent variable is influenced directly, two further effects can be distinguished: the mediator and the moderator effect (Baron & Kenny, 1986). In this context, a mediator is a variable that explains a certain part of the connection between the predictor and the criterion. A moderator, by contrast, is defined as a variable that affects the direction or the strength of the connection between a predictor and the outcome variable. Bearing this distinction in mind, the relationship between the achievement motive and athletic performance can be described by means of various models, which are presented in a formalised way in Table 1.

*** Insert Table 1 here ***

In the *main effect model* (Tab. 1, No. 1) the achievement motive (AM) is taken to have a direct influence on performance/performance development (P), without any form of mediation. According to Baker and Horton (2004), psychological factors, in particular motivational variables, are primary factors in developing sports expertise, alongside genetic factors and training. The main effect model is also favoured by Hohmann's process model of sports talents (Hohmann, 2009, p. 111), in which it is suggested that motivation has a direct impact on current competitive performance, however the precise mechanism by which this happens remains unspecific. Hohmann (2009, p. 269) is able to partially support the main effect model by means of path analytical model testing.

Training volume (TV) is viewed as a variable that mediates the interaction between the achievement motive and performance (*mediator model – training volume*, Tab. 1, No. 2).

The achievement motive is seen here as an essential prerequisite for the concrete willingness to train (Abbott & Collins, 2004). Empirical evidence in support of this has been found by Halvari and Kjormi (1999) in potential Olympians in Norway.

Motor abilities and sport-specific skills are considered to be a second potential mediator. Path analysis in the domain of tennis has revealed that motivation influences athletic performance not directly but rather *indirectly*, via motor abilities and specific tennis skills (*mediator model – motor function*, Tab. 1, No. 3). This means that a higher level of motivation leads to higher-quality motor abilities and skills, which in turn affects the athletic performance positively – via the mediator effect (Schneider, Bös, & Rieder, 1993).

In the *moderator model* (Tab. 1, No. 4), the strength of the achievement motive is suggested to moderate the relationship between motor function and athletic performance. In Heller's Munich model of giftedness (Heller, 2005), and also in the version specifically adapted to sports (Hohmann, 2009, p. 311), motivational variables are assumed to act as *moderators*, systematically changing the relationship between the predictors and performance. If this assumption is correct, pronounced motor abilities and skills should be associated with particularly high athletic performance especially in highly motivated athletes. A similar discussion of this assumption is found in the Differentiated Model of Giftedness and Talent (van Rossum & Gagné, 2005), in which motivational variables are described as catalysts which accelerate the development from "natural abilities to superior mastery of systematically developed abilities" (p. 707). Furthermore, psychological features are attributed with playing a moderating role in turning athletic potential into athletic performance (Abbott & Collins, 2004; MacNamara et al., 2010; Morris, 2000).

Since multidimensional designs are increasingly being recommended in order to improve the prediction of performance (Auweele, Cuyper, Mele, & Rzewnicki, 1993), the *multiple main effect model* (Tab. 1, No. 5) is discussed as an extension of the *simple* main effect model (No. 1). Most of the newer talent models include predictors of different dimensions (e.g. Williams & Franks, 1998), Since the present paper will mainly focus on the achievement motive, as well as motor abilities and sport-specific skills (as mediators in Model 3), these three constructs will be examined jointly in terms of their direct and contemporaneous influence on athletic performance, despite the fact that the model does not occur in the literature in this form. Smith und Christensen (1995) were able to show that psychological and motor skills each independently play an important part in explaining athletic performance.

As the sport scientific findings are still rather meagre, we expand our focus and present the main findings and theories from general and pedagogical psychology. In these fields too, the causal relationship between the achievement motive and performance has not been adequately established. Realising that the findings from the field of psychology cannot be transferred unconditionally to the field of sports, we will nevertheless assume that they can contribute to current sports scientific understanding. According to Brunstein and Heckhausen (2010), the relationship between achievement motivation and performance is mediated by task-related abilities. Thereby the mediating influence of task-related abilities on performance is again emphasised, i.e. intelligence in the case of cognitive and motor function in the case of motor tasks. This supports the mediator model – motor function (Tab. 1, No. 3). Atkinson (1974) assumes that the relationship between the achievement motive and performance is – in addition to other mechanisms – mediated in the long term by the amount of time invested. These assumptions therefore speak for the relationship between the strength of the achievement motive and performance being mediated by the time invested, and hence for the mediator model – training volume (Tab. 1, No. 2).

The present research

To summarise, the current state of research suggests five models that can be used to explain the relationship between the achievement motive and athletic performance. Since empirical evidence is still fairly meagre, none of the models can be favoured as yet. Instead it seems appropriate to subject all of them to a comparison in the following empirical section. This will not so much primarily be about taking a snapshot focusing on the current conditions for athletic performance, but rather about the developmental aspect in the sense of asking to what extent the achievement motive predicts the future development of athletic performance. For this reason a longitudinal design is necessary.

Talent research typically calls for a prediction of performance at the age of peak performance. However, since on the one hand it is very difficult to fulfil the scientific requirements over such a long period of study, and on the other hand intermediate outcomes in the process of talent development are also relevant (e.g. for talent selection), a shorter period of study has been chosen by way of compromise. Hence, instead of studying the long-term effects on the age of peak performance, we will look at medium-term effects in adolescence, drawing on a sample of talented young football players by way of example.

Method

Procedure

The longitudinal collection of the data took place with an interval of approx. 7 months. At t_1, the achievement motive and the motor abilities and skills were determined. At t_2, the training volume between t_1 and t_2 was ascertained, and the motor tests were carried out for the second time. Immediately after t_2, the coaches rated the current performance of their players using performance assessment forms.

Participants

At t_1, 160 male, top-class football talents, who belonged to six different regional squads of the Swiss Football Association were recruited for the study. Those 140 players (M_{Age} = 12.26, SD = 0.29) whose performance was rated by at least one coach at t_2, were included in the analyses. Of these, n=122 also took part at t_2. The study was approved by the Ethics Committee of the Faculty of Human Sciences at the University of Bern.

Measures

Achievement motive. In order to determine the achievement motive, the two components Hope for Success (HS) and Fear of Failure (FF) were measured using the German version of the short scale of the *Achievement Motives Scale-Sport (AMS-Sport)* by Wenhold, Elbe and Beckmann (2009). Each scale consists of five items, with a four-point response scale (from 0 = "does not apply to me at all" to 3 = "applies completely to me"). The internal consistencies had acceptable values for group comparisons, at $\alpha_{HS} = .72$ and $\alpha_{FF} = .77$, particularly in view of the brevity of the measure (cf. Vaughn, Lee, & Kamata, 2012).

Training volume. The training volume between t_1 and t_2 was ascertained by means of a questionnaire completed during the second testing session. The number of hours of training in the club and in the regional squad, as well as the number of hours of free play, were then summed for an average week.

Motor function: specific, football-related abilities and skills. The specific, football-related abilities and skills were determined by means of seven motor tests. The skills are operationalised via the factor *Football Technique*. In factor analytical terms, this encompasses three tests that ascertain dribbling, juggling and ball control (Höner & Roth, 2010; Lottermann, Laudenklos, & Friedrich, 2003). Four further tests, measuring speed (40-metre sprint), agility (slalom run; Lottermann et al., 2003), intermittent endurance (Yo-Yo

Test; Bangsbo, Iaia, & Krustrup, 2008) and jumping strength (countermovement jump; Casartelli, Muller, & Maffiuletti, 2010) are collected by factor analysis to form the factor *Fitness* (football-related abilities).

Athletic performance. A visual scale estimation procedure was used to rate the players' performance externally. Two coaches from each regional team carried out the assessment of their players' current game performance on a visual scale between 0-100. In doing so, each player was meant to be compared with the other players in regional teams in Switzerland. Players in a (fictitious) Junior National Team should score between 90 and 100, whereas very poor players in a weak team would score between 0 and 10. The inter-rater reliability for the procedure can be described as satisfactory, with a concordance coefficient of r_{tt} = .89.

Data processing and analysis

The models under investigation were expressed in terms of structural equation models and their goodness of fit (ML method) was compared using AMOS 19. All in all, between 0.5% and 6.6% of values were missing, depending on the model used. These were identified as missing completely at random using the MCAR test by Little (p = .07) (Tabachnik & Fidell, 2013). As the Mardia test reveals a deviation from the multivariate normal distribution, a Bollen-Stine bootstrap correction is performed on the *p*-value (Byrne, 2010). Since bootstrapping requires complete data sets, the missing values were simply imputed using AMOS's regression procedure. Based on the requirements stipulated by Tabachnick and Fidell (2013), no multivariate outliers were identified. The fit indices for evaluating the fit of the structural equation models were assessed in terms of content following the procedure proposed by Schermelleh-Engel, Moosbrugger, and Müller (2003). Before comparing the structural models themselves, the measurement model of the achievement motive components was tested using confirmatory factor analysis. The latent variable

Athletic performance – operationalised in the form of the two assessments of the players by the team coaches – represents the dependent variable. The achievement motive components, HS and FF, as well as the motor components Technique and Fitness were included separately in the models.

In order to test the mediator effects, bootstrapping was used to check whether the indirect effects of interest were significantly different from zero (Shrout & Bolger, 2002). To test the moderator model, a multi-group comparison was carried out to see whether there were any differences in the predictive weights of Fitness and Technique on Athletic performance between two differently motivated groups. Two groups (high vs. low achievement motive, both in terms of HS and in terms of FF) were formed by means of a median split. A chi-square difference test was then used to check whether the restricted model, in which the predictive weights are set to be equal for the two groups, represents the data less well, which would indicate a moderator effect (Byrne, 2010). The relevance of the path coefficients was examined based on the recommendation by Chin (1998), whereby standardised regression weights greater than .20 are to be considered relevant.

The models presented were compared by means of the informational criterion "Expected Cross Validation Index (ECVI)". The ECVI indicates how good the cross-validation of the model would be using a sample of similar size, whereby no cut-off criterion is used. Instead, the models can be ranked. The one with the lowest ECVI score can be viewed as being the most reproducible (Browne & Cudeck, 1993).

Results

Descriptive statistics

Table 2 presents the descriptive statistics for the manifest study variables, as well as the HS and FF scales. Overall, subjects displayed comparatively homogenous levels with low variances on both achievement motive scales. One striking feature is the floor effect in FF, while HS is fairly high.

*** Insert Table 2 here ***

Structural equation modelling

Measurement model achievement motive. Looking at the global fit indices of the confirmatory factor analysis, the model is found to display an acceptable fit with only a very small deviation between the theoretical and the empirical covariance matrix (Table 3, Model a). However, higher values would be preferable particularly for the CFI and lower values for the RMSEA. The local model fit can be described as good, since all factor loadings are significant. In order to further improve the model, the items were summarised (parcelled). The advantage of parcelling lies in the reduction of the number of parameters to be estimated. Particularly with small samples, this leads on the one hand to better fit indices for non-normally distributed items, and on the other hand to more stable and reliable parameter estimates (cf. Bandalos, 2002). In order to achieve factor loadings that were as balanced as possible, the item with the highest loading was in each case paired with the lowest-loading item etc. (Little, Cunningham, Shahar, & Widaman, 2002). As a result, the five indicators per latent achievement motive component were summarised and averaged into three parcels each. As expected, this results in a distinctly improved global model fit (Table 3, Model b), while all local quality criteria remain significant (cf. Fig. 1, Model 1). The model that has been improved by parcelling ensures that the facets of the achievement motive can be measured to a high standard of quality, and can now be used to examine the structural models. These are displayed in Figure 1, together with the resulting loadings. Furthermore, Table 3 shows the corresponding global fit indices.

Model 1. The main effect model displays a very good fit with the empirical data. In the structural model, however, only the path from HS to Performance is significant ($\beta_{HE \rightarrow P}$ = .26, C.R. = 2.20, *p* = .03; $\beta_{FF \rightarrow P}$ = .08, C.R. = 0.73, *p* = .47). Thus, 6% of the overall variance in the dependent variable Performance can be explained.

Model 2. When Model 1 is expanded by adding training volume as a mediating variable, the explained variance in the dependent variable does not increase. The indirect effects of HS/FF on Performance via training volume are not different from zero ($\beta_{ind:HS \rightarrow P}$ < .001, $p_{ind:HS \rightarrow P}$ = .68; $\beta_{ind:FF \rightarrow P}$ = .01, $p_{ind:FF \rightarrow P}$ = .35), which speaks against this mediator effect (Shrout & Bolger, 2002).

Model 3. When the latent variables Technique and Fitness at t_2 are introduced as mediators, the explained variance in Performance increases by 16% to 22%. This is due to the significant path from Fitness to Performance ($\beta_{FIT \rightarrow P}$ = .30, C.R. = 2.73, *p* = .006). Although the effect of Technique on Performance is not statistically significant ($\beta_{TECH \rightarrow P}$ = .29, C.R. = 1.39, *p* = .16), it can nevertheless be considered to be relevant in practical terms (Chin, 1998). However, the mediator hypothesis cannot be confirmed because again the indirect effects of HS and FF on Performance are not significantly different from zero ($\beta_{ind:HS \rightarrow P}$ = -.09, $p_{ind:HS \rightarrow P}$ = .46; $\beta_{ind:FF \rightarrow P}$ = -.13, $p_{ind:FF \rightarrow P}$ = .09). Apart from the local quality criteria, the global model fit also tends to speak against the mediator model – motor function (Table 3, Model 3).

Models 4a/4b (HS) and 4c/4d (FF) (not shown). Comparing the restricted Model 4b with the unconstrained Model 4a using the chi-square difference test (*p* = .84) revealed no difference. Also, the regression weights do not differ depending on assignment to a particular group (high vs. low achievement motivation, ($p_{HS:Fit \rightarrow P}$ = .66, $p_{HS:Tech \rightarrow P}$ = .90). The same result is also found with respect to FF (Models 4c and 4d). Again, the chi-square difference test (p = .17) does not indicate any difference between the restricted and the unconstrained model and the regression weights ($p_{FF:Fit \rightarrow P}$ = .34, $p_{FF:Tech \rightarrow P}$ = .35). Accordingly, neither of the achievement motive components serves as moderators (Byrne, 2010).

Model 5. The multiple main effect model is able to explain by far the largest amount of the variance (33%) in the dependent variable of all the models examined. In addition, it reproduces the empirical data very well (Tab. 3). However, on the level of local quality criteria only the predictive influence of HS on Performance is found to be significant ($\beta_{HE \rightarrow P}$ = .24, C.R. = 2.26, p = .02; $\beta_{FF \rightarrow P}$ = .09, C.R. = 0.95, p = .34). On the other hand, the standardised regression weights of the motor factors both exceed .20, the threshold for practical relevance proposed by Chin (1998) ($\beta_{TECH \rightarrow P}$ = .37, C.R. = 1.78, p = .08; $\beta_{FIT \rightarrow P}$ = .23, C.R. = 1.52, p = .13). As the Critical Ratio (C. R.) is calculated by dividing the estimated, unstandardized value of the parameter by the standard error for that estimate (Byrne, 2010), a large standard error might prevent the critical threshold for significance from being reached, even though the result has practical relevance.

Table 3 shows that based on the informational criterion ECVI, the main effect model should be favoured.

*** Insert Figure 1 here ***

*** Insert Table 3 here ***

Discussion

Achievement motivation is thought to play an important role in the development of athletic peak performance. However, until now the way in which the achievement motive influences performance has not been adequately studied. The present study examined longitudinally which of the models proposed in the literature to date best represents the connection between the achievement motive and athletic performance half a year later. In a sample of achievement-oriented young football talents, it was found that the main effect model reproduces this connection best. This agrees with the assumptions made by Baker and Horton (2004) and the empirical findings of Hohmann (2009, p. 269). Having found a negative relationship between HS and FF, one might speculate that the increased optimism and relatively lower level of anxiety that are attributed to success-motivated individuals, are expressed positively during the game, e.g. becoming apparent in the form of high self-assurance, persistence and commitment, even in difficult situations (cf. Brunstein & Heckhausen, 2010).

Contrary to expectations (Halvari & Thomassen, 1997), FF does not make any contribution to explaining performance half a year later. One reason might be that the sample is already positively selected in terms of the achievement motive, which is seen in the floor effect in FF and the ceiling effect in HS. Low variances, like the ones we find in the two motive dimensions, are known to be associated with a restricted covariance. Since the covariance matrix forms the basis of the SEM, it is conceivable that relationships which may actually exist are underestimated by it and that a sample that was less homogenous in this respect would reveal the assumed effects.

Similarly, none of the postulated mediator and moderator effects were observed. Contrary to empirically based assumptions (e.g. Schneider et al., 1993), greater HS did not find expression in terms of greater physical fitness or better technical skills or a higher training volume. Perhaps the achievement motive only exerts its positive influence on training volume in the longer term (Schorer et al., 2010) or at later stages of the players' development, when they are older and take more responsibility for their own training. On the other hand, the achievement motive could also have more of an effect on the quality and intensity of training. It would therefore be interesting to measure these in more detail in future studies.

Nevertheless, particularly the Mediator model – motor function produce some interesting results, which re-emerge in the Multiple main effect model. Aside from HS, the specific, football-related technique and fitness contribute substantially to the explanation of the performance half a year later, confirming the widespread assumption that athletic performance in football must be explained by multifactorial means (e.g. Smith & Christensen, 1995; Williams & Franks, 1998).

Although the direct comparison of the models in terms of its EVCI clearly favours the Main effect model, the extended Multiple main effect model including the motor components should nevertheless be ignored. Its high score results from its penalisation for the high complexity of the model, which includes a distinctly larger number of variables than the other models tested (Kline, 2011). Although this makes the results less easy to reproduce, it also leads to a distinctly higher explained variance of 33%.

The results of the present study must be viewed critically in terms of the following points. On the one hand, the size of the sample is comparatively small for structural equation modelling, so that cross-validation should be carried out using a larger sample. Presumably, the athletic performance in regional squads differs on account of structural differences (e.g. degree of professionalism varying between regions). However, carrying out the required multilevel analyses calls for a distinctly larger number of study groups (e.g. teams) (Hox, 2010), which are however virtually impossible to find at this level. Furthermore, the opposite mechanism between achievement motive and performance is also conceivable: the achievement motive may not only impact athletic performance, but may itself be fed by athletic successes (Atkinson, Lens, & O'Malley, 1976). Because of this, it is not justifiable to draw conclusions about causality in the stricter sense, based on this longitudinal survey. However one could speak of an explanatory prediction of the achievement motive and motor skills (Bagozzi & Yi, 2012). Further studies should use a cross-lag panel design in which both the performance parameters and the motive strengths are determined at several points in time, allowing the influence of the achievement motive or previous performance to be analysed separately. Furthermore, it remains unclear how the achievement motive affects athletic performance at the *age of peak performance*, since the present study only analysed effects occurring over the period of half a year, while at the same time the players were still in adolescence and therefore still far from their athletic peak performance. Distinctly longer periods are necessary for the long-term study of the causal relationships between predictors in adolescence and athletic performance at the age of peak performance, which are crucial to talent research.

The multifactorial nature of football performance already mentioned makes it more difficult to describe and check the underlying mechanisms. Poor conditions for performance in one sector can be compensated by strengths in a different area, meaning that on an individual level different combinations of different predictors can lead to the same level of performance (Abbott & Collins, 2004). In addition, the influence of the predictors may change over time. Nevertheless, the study in hand has been able to show that HS can directly explain part of football performance half a year later, and can therefore be regarded as a notable talent predictor, at least in the medium term.

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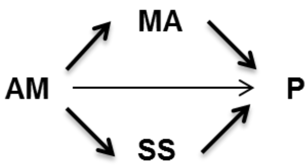
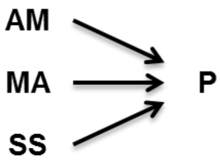
Table 1

Formalised Summary of the Potential Relationships Between Achievement Motive and Performance, as Postulated in the Literature

No.	Model	Name	Reference
1		Main effect model	Baker & Horton (2004); Hohmann (2009)
2		Mediator model – training volume	Abbott & Collins (2004); Halvari & Kjormo (1999)
3		Mediator model – motor function	*Brunstein & Heckhausen (2010);* Schneider, Bös & Rieder (1993)
4		Moderator model	*Heller (2005);* Hohmann (2009); van Rossum & Gagné (2005)
5		Multiple main effect model	Smith & Christensen (1995); Williams & Franks (1998)

Note. AM = achievement motive; P = performance; TV = training volume; MA = motor abilities; SS = sport-specific skills. Sources in *italics* are not specific to sports.

Table 2

Descriptive Statistics of the Variables Examined

Study variable	*M*	*SD*	*Min*	*Max*	Skewness
Hope for Success (HS)	2.45	0.47	1.20	3.00	-0.56
Fear of Failure (FF)	0.60	0.58	0.00	3.00	1.10
Weekly training volume, hours (TV)	10.34	3.24	3.86	28.07	1.92
Performance (Coach 1) (P)	52.73	22.34	7.00	95.00	0.11
Performance (Coach 2) (P)	54.12	22.72	4.00	95.00	-0.16

Note. N=140 for all variables except training volume (N=122)

Table 3

Global Fit Indices of the Tested Structural Equation Models Compared With the Thresholds For Acceptable Fit According to Schermelleh-Engel et al. (2003) and Browne and Cudeck (1993) For the Informational Criterion ECVI

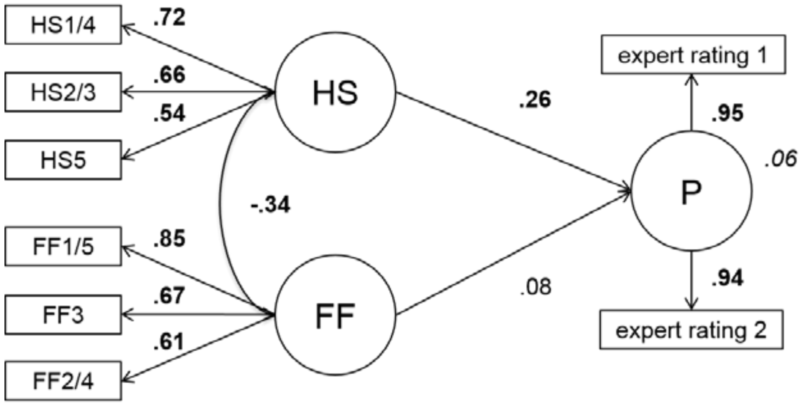
Model	No.	χ^2	*p*(df)[a]	χ^2/df	CFI	RMSEA (C.I. 90%)[b]	SRMR	ECVI
Acceptable fit			>.05	< 3	>.95	≤.08 (<.05-<.10)	≤.10	lower[c]
Confirmatory factor analyses								
Measurement model HS & FF	a	58.49	.08 (34)	1.72	.92	.07 (.04–.10)	.06	0.72
Measurement model HS & FF, parcelled	b	7.29	.52 (8)	0.91	1	.00 (.00-.09)	.03	0.24
Model comparison								
Main effect	1	13.61	.73 (18)	0.76	1	0 (.00-.05)	.03	0.36
Mediator TV	2	26.74	.24 (23)	1.16	.99	.34 (.00-.08)	.04	0.64
Mediator Motor Function	3	136.08	<.001 (82)	1.66	.90	.07 (.05-.09)	.08	1.53
Moderator HS unconstrained	4a	85.40	.01 (50)	1.71	.94	.05 (.01-.08)	.08	0.98
Moderator HS restricted	4b	85.74	.01 (52)	1.65	.94	.05 (.00-.08)	.08	0.97
Moderator FF unconstrained	4c	86.42	.01 (57)	1.52	.92	.06 (.03-.09)	.09	1.36
Moderator FF restricted	4d	89.93	.01 (59)	1.52	.92	.06 (.03-.19)	.10	1.36
Multiple main effect	5	101.48	.26 (85)	1.20	.97	.04 (.00-.06)	.06	1.45

Note. C.I. = confidence interval

[a]corrected p-value using Bollen-Stine bootstrap. [b]for N < 250. [c]lower than corresponding values of comparison models

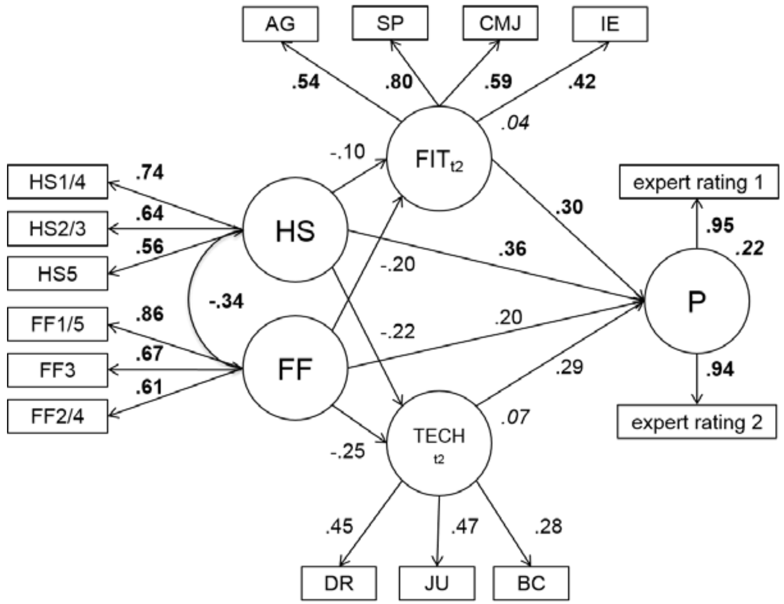
Figure 1. Structural equation modelling with standardised regression coefficients 1) Main effect model, with measurement model achievement motive 2) Mediator model – training volume 3) Mediator model – motor function 5) Multiple main effect model. FF = Fear of Failure, HS = Hope for Success, P = Performance; TV = training volume; FIT = Fitness; TECH = Technique; AG = agility, SP = sprint, CMJ = countermovement jump, IE = intermittent endurance, DR = dribbling, JU = juggling, BC = ball control. **bold:** $p < .05$; *italic*: squared multiple correlations.

1)



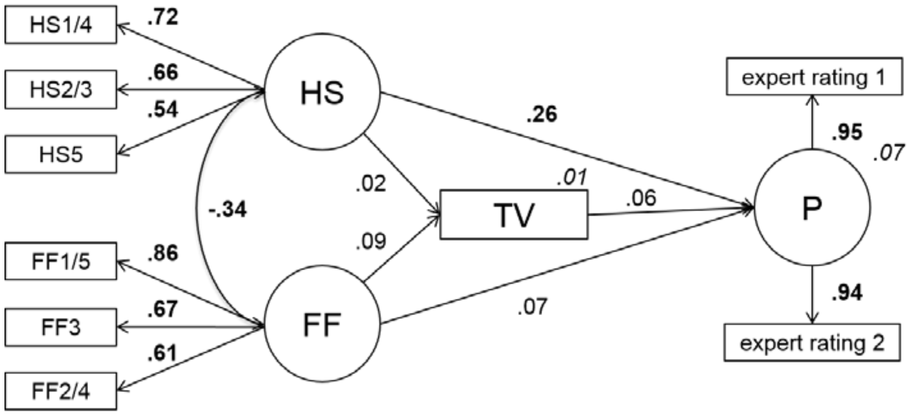
HS1/4
HS2/3
HS5
FF1/5
FF3
FF2/4
.72
.66
.54
.85
.67
.61
HS
FF
-.34
.26
.08
P
.06
expert rating 1
expert rating 2
.95
.94

3)



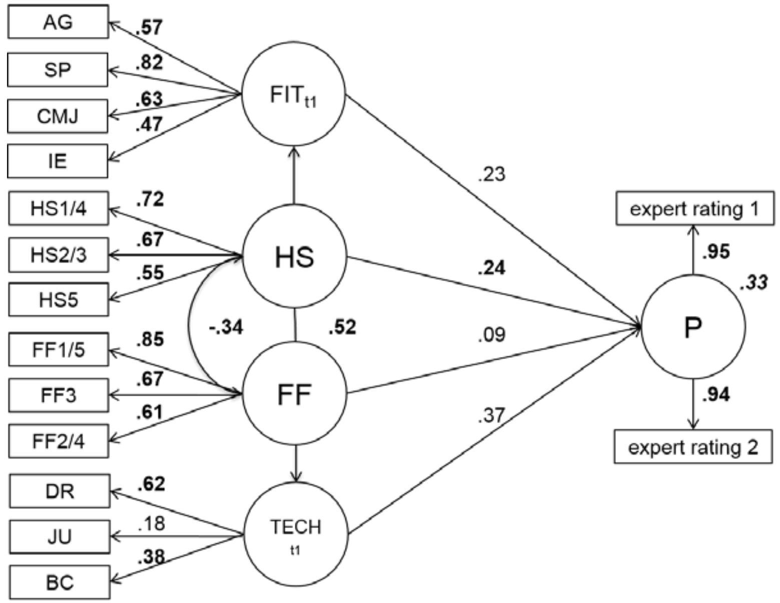
AG
SP
CMJ
IE
.54
.80
.59
.42
.04
FIT t2
-.10
HS1/4
HS2/3
HS5
FF1/5
FF3
FF2/4
.74
.64
.56
.86
.67
.61
HS
FF
-.34
-.20
-.22
-.25
.30
.36
.20
.29
TECH t2
.07
.45
.47
.28
DR
JU
BC
P
.22
expert rating 1
expert rating 2
.95
.94

2)



HS1/4
HS2/3
HS5
FF1/5
FF3
FF2/4
.72
.66
.54
.86
.67
.61
HS
FF
-.34
.02
.09
TV
.01
.06
.26
.07
P
.07
expert rating 1
expert rating 2
.95
.94

5)



AG
SP
CMJ
IE
.57
.82
.63
.47
FIT t1
HS1/4
HS2/3
HS5
.72
.67
.55
HS
-.34
.52
FF1/5
FF3
FF2/4
.85
.67
.61
FF
DR
JU
BC
.62
.18
.38
TECH t1
.23
.24
.09
.37
P
.33
expert rating 1
expert rating 2
.95
.94