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Motivational Patterns as an Instrument for Predicting Success in Promising Young Football
Players

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We would like to thank the Swiss Football Association for supporting and funding this
research project.

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Abstract

20
21 Psychological characteristics are crucial to identifying talents, which is why these are being
22 incorporated in today's multidimensional talent models. In addition to multidimensionality,
23 talent studies are increasingly drawing on holistic theories of development, leading to the use
24 of person-oriented approaches. The present study adopts such an approach by looking at the
25 influence that motivational characteristics have on the development of performance, in a
26 person-oriented way. For this purpose, it looks at how the constructs achievement motive,
27 achievement goal orientation and self-determination interact with one another, what patterns
28 they form and how these patterns are linked to subsequent sports success. 97 top young
29 football players were questioned twice. Another year later, it was enquired which of these
30 players had been selected for the U15 national team. At both measuring points, four patterns
31 were identified, which displayed a high degree of structural and individual stability. As
32 expected, the *highly intrinsically achievement-oriented players* were significantly more likely
33 to move up into the U15 national team. The results point to the importance of favourable
34 patterns of motivational variables in the form of specific types, for medium-term performance
35 development among promising football talents, and thus provide valuable clues for the
36 selection and promotion of those.

37 *Keywords:* person-oriented approach, motivation, pattern analysis, predicting success, football

38

Introduction

39 The importance of psychological characteristics for competitive sports is undisputed.
40 They are integrated as potential talent attributes into talent models that try to trace the
41 connections believed to exist between predictors and performance development or
42 performance in sports (van Rossum & Gagné, 2006; Williams & Franks, 1998). On an
43 empirical level too, various studies have demonstrated a connection between individual
44 psychological characteristics and performance in sports (Coetzee, Grobbelaar, & Gird, 2006;
45 MacNamara, Button, & Collins, 2010). However, in view of the high complexity of talent
46 development, it is not enough to describe the connection between different characteristics and
47 performance in sports, because this does not take into account potential mutual interactions,
48 nor possible compensation effects between the different variables (Meylan, Cronin, Oliver, &
49 Hughes, 2010). For some time, therefore, it has repeatedly been recommended to use
50 multidimensional designs to predict performance (Abbott & Collins, 2004; Auweele, Cuyper,
51 Mele, & Rzewnicki, 1993; Fisher, 2008) and to include predictors of different dimensions in
52 talent models (Williams & Franks, 1998). In such designs, the focus no longer lies on
53 individual variables and the way in which they are connected to a performance criterion, but
54 rather on entire groups of variables.

55 Since questions dealing with talent development refer to human developmental
56 processes, it is helpful to draw on current theories of human development. Within the field of
57 developmental science, dynamic interactionist approaches are favoured when explaining
58 human development (Magnusson, 1990; in sport science Conzelmann, 2001). In addition to a
59 dynamic interactionist perspective, Magnusson and Cairns (1996) take a holistic view of
60 human development. In view of a complex interpretation of talent, this holistic approach
61 seems to be particularly appropriate when dealing with questions of talent development. An
62 individual functions and evolves as a holistic organism, whose various aspects do not develop
63 independently of one another. The individual and his environment are regarded as a system

64 (Magnusson & Stattin, 2006). Hence when analysing human development, the individual
65 should always be viewed as a whole. The person-environment system can be subdivided into
66 different subsystems, which mutually interact with each other (Bergman & El-Khoury, 2003).
67 This holistic approach leads to a change in perspective, from the – hitherto dominant –
68 variable-oriented to a person-oriented approach. The person-oriented approach (Bergman &
69 Magnusson, 1997), in turn, has a number of methodological consequences: Firstly, the
70 variables involved in a (sub)system need to be measured as completely as possible. Secondly,
71 it is necessary to dispense with statistical methods based on the *General Linear Model*, since
72 the reciprocal interactions between the variables mean that the assumption of linearity has to
73 be sacrificed (Bergman & Magnusson, 1997).

74 Pattern analyses are one possible method of implementing the person-oriented
75 approach. In these, states of the system (so-called patterns) are depicted at different times and
76 the transitions between these patterns are analysed. The variables involved in a system are
77 referred to here as operating factors (Bergman, Magnusson, & El-Khoury, 2003). Due to the
78 high complexity of the person-environment system, empirical studies often focus on one
79 subsystem. Although this inevitably means a certain simplification, the basic idea of this
80 approach remains intact. For a more detailed overview of the person-oriented approach, cf.
81 Bergman, Magnusson and El-Khoury (2003) and for a comparison with the variable-oriented
82 approach, cf. Bergman and Andersson (2010).

83 Recently, attempts have been made to integrate such holistic, developmental scientific
84 concepts and their methodological consequences into sports talent research, too. So far,
85 promising results have been achieved for the subsystem *training* (Zibung & Conzelmann,
86 2013). Corresponding studies are not yet available for psychological subsystems, although it
87 is reasonable to assume that possible compensation effects and mutual interactions will matter
88 in this field too. It therefore seems an obvious choice to use the person-oriented approach in

89 the psychological field as well, so as to gain a better understanding of the connection between
90 psychological characteristics, their interaction and the development of performance in sports.

91 In this performance-related context, choosing operating factors requires the use of
92 performance-related variables. In talent research, within the psychological system,
93 motivational variables are viewed as being particularly relevant to talent development and
94 later success (Abbott & Collins, 2004). The achievement motivation models that are currently
95 being discussed most actively are the hierarchical model of achievement motivation (Elliot &
96 Church, 1997) and self-determination theory (Deci & Ryan, 1985), whereby Conroy, Elliot
97 and Coatsworth (2007) recommend combining these two concepts when examining
98 *competence* from a motivational perspective. For this reason, in the current study the
99 constructs discussed in these two theories are seen as motivational subsystem. These
100 constructs are *hope for success* and *fear of failure*, which are both components of the
101 achievement motive, as well as the achievement goal orientations *task* and *ego orientation* –
102 linked to each other in the hierarchical model of achievement motivation – as well as *self-*
103 *determination*.

104 **Achievement motivation**

105 The achievement motive determines whether individuals tend to approach achievement-
106 related situations or whether they tend to avoid them (Atkinson, 1957). The positive
107 connection between hope for success and performance in sports has been empirically
108 confirmed in both cross-sectional (Coetzee et al., 2006; Halvari & Thomassen, 1997) and
109 longitudinal studies (Elbe & Beckmann, 2006; Unierzyski, 2003). Fear of failure, on the other
110 hand, is often associated with a negative correlation with performance (Halvari & Thomassen,
111 1997; Sagar, Busch, & Jowett, 2010). The two classical facets of the achievement motive are
112 considered to be independent of one another (Brunstein & Heckhausen, 2010). Empirically,

113 however, questionnaire surveys have for the most part demonstrated moderate to high
114 negative correlations (Elbe & Wenhold, 2005).

115 **Achievement goal orientation**

116 Whereas the achievement motive initiates actions aimed at attaining competence,
117 achievement goal orientations guide these actions towards certain goals. Two different goal
118 orientations are distinguished, which are either called task and ego orientation (Nicholls,
119 1984) or mastery and performance orientation (Ames & Archer, 1988). Task/mastery
120 orientation is aimed at improving one's own skills, for which purpose an internal standard of
121 comparison is used. Ego/performance orientation, on the other hand, focuses on displaying
122 one's own superiority to other people. Its aim is to do better than others, and to show it
123 (Heckhausen & Heckhausen, 2010; in sport science: Duda 1993; 1992).

124 Among young football players, elite players have been found to display greater task
125 orientation than those of their peers who achieve a lower level of performance (Reilly,
126 Williams, Nevill, & Franks, 2000).

127 **Self-determination**

128 In self-determination theory, the reasons for motivated actions are distinguished
129 according to where their perceived locus of causality is, or to what extent they are self-
130 determined. The resulting motivational type lies on a continuum extending from amotivation,
131 a state with a complete absence of any motivation, through extrinsic motivation, to intrinsic
132 motivation as the most self-determined form of motivation (Ryan & Deci, 2000). Intrinsic
133 motivation is characterised by pleasure in performing the activity itself. Extrinsic motivation,
134 on the other hand, pertains to actions which are carried out because of the expected
135 consequences, such as fame, honour or prize money. Four types of extrinsic motivation are
136 postulated, which are characterised by increasingly high levels of self-determination or
137 autonomy (for an overview, see Ryan & Deci, 2007).

138 On the level of individual variables, a high degree of self-determination has been shown
139 to be associated with higher levels of performance, both in adult athletes (Gillet, Vallerand,
140 Amoura, & Baldes, 2010) and in adolescents taking part in physical education classes (Biddle
141 & Brooke, 1992; Boiché, Sarrazin, Grouzet, Pelletier, & Chanal, 2008). Conversely, low
142 levels of self-determination appears to hamper a successful sports career in the sense of
143 dropping out (Calvo, Cervello, Jimenez, Iglesias, & Murcia, 2010; Pelletier, Fortier,
144 Vallerand, & Brière, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002) or a lower
145 level of performance in sports (Boiché et al., 2008). Depending on the cultural background,
146 however, high levels of extrinsic motivation and amotivation can also lead to high levels of
147 performance in sports (Chantal, Guay, Dobрева-Martinova T., & Vallerand, 1996).

148 On the level of combinations of variables within self-determination theory, only isolated
149 analyses have been conducted to date in connection with performance in sports. The identified
150 clusters did not differ so much in qualitative terms, as regards the composition of the scale
151 combinations, but rather quantitatively, concerning the level of self-determination. In line
152 with the hypotheses, it was found that members of the cluster with the lowest self-
153 determination scores do least well (Boiché et al., 2008; Gillet, Vallerand, & Rosnet, 2009).

154 **Combinations of variables**

155 For a long time, the two facets of the achievement motive, hope for success and fear of
156 failre, and the achievement goal orientations task and ego orientation were studied
157 independently of one another. Elliot and Church (1997) later suggested the hierarchical model
158 of achievement motivation, in which the achievement goal orientations are positioned, as mid-
159 level constructs, between achievement motive, with its components hope for success and fear
160 of failure, as the overarching motivational construct, and specific behaviours. From this
161 combination of achievement motive components and achievement goal orientations, they
162 initially extracted three achievement goals (Elliot & Church, 1997). Of the original
163 achievement goals in the hierarchical model of achievement motivation, performance-

164 approach goals are associated with positive effects, and performance-avoidance goals with
165 negative effects on performance. Mastery goals have positive effects on intrinsic motivation,
166 but no effect on performance (Elliot & Church, 1997).

167 The combination of achievement goal orientations and self-determination was
168 investigated by McNeill and Wang (2005), who were able to identify the three clusters
169 ‘amotivated’, ‘highly motivated’ and ‘high task mastery’. Competitive athletes were assigned
170 particularly to the “highly motivated” cluster, characterised by high scores on all the factors
171 measured, except for amotivation, whereas non-athletes consisted mainly of amotivated
172 individuals, with low scores on all variables apart from amotivation.

173 The research carried out so far into the connection between the discussed motivational
174 variables of performance in sports – both as individual variables and as combinations of
175 variables – can be summarised as follows: HS combined with high self-determination appears
176 to be particularly beneficial to performance, since both concepts are associated positively with
177 performance in sports (Biddle & Brooke, 1992; Boiché et al., 2008; Coetzee et al., 2006; Elbe
178 & Beckmann, 2006; Gillet et al., 2010; Halvari & Thomassen, 1997; Unierzyski, 2003; Zuber
179 & Conzelmann, 2013). fear of failure and low self-determination, on the other hand, seem to
180 have a negative influence on the development of performance in sports (Calvo et al. 2010;
181 Halvari & Thomassen, 1997; Sagar et al., 2010). Concerning the achievement goal
182 orientations, the findings are ambiguous. Thus it seems that high levels of performance may
183 be associated with high levels of achievement orientation both in a combined form (McNeill
184 & Wang, 2005) and individually (Elliot & Church, 1997; Reilly et al., 2000).

185 **The present research**

186 Based on the research presented so far and using a person-oriented approach, we will
187 first depict patterns of motivation-psychological variables in order to describe the state of the
188 system at a certain time, using the game of football as an example. In addition, we will

189 examine the stability of these patterns, since this is of key importance in predicting success
190 (cf. Régnier, Salmela, & Russell, 1993). Two types of stability need to be distinguished. If the
191 patterns remain stable on a group level (structural stability; Bergman et al., 2003), then the
192 same patterns can be identified at different points in time. If certain courses of development
193 are more frequent on an individual level than predicted by chance, (individual stability;
194 Bergman et al., 2003), then these are described as developmental types. If these types are in
195 addition associated with success in sports – which will also be examined in this paper –
196 promoting a player who displays those patterns should be particularly promising. If individual
197 stability occurs between patterns that are themselves structurally stable, it can in addition be
198 assumed that it does not matter at what point in time the type is determined, a fact that would
199 be particularly valuable to the talent selection process.

200 Our analysis will therefore be guided by the following questions:

- 201 1. Which patterns can be identified in promising young football players in terms of the
202 three concepts achievement motive, achievement goal orientation and self-
203 determination?
- 204 2. Can the same patterns be seen again at a later time (structural stability)?
- 205 3. What developmental paths are followed by the young football talents during this time
206 interval (individual stability)?
- 207 4. Do the patterns found allow hypotheses to be put forward concerning a player's later
208 success in sports?
- 209 5. Are certain patterns associated with a particularly high level of sports success later,
210 and are any hypotheses that may have been deduced confirmed?

211 Since the hypotheses of the fourth question can only be formulated once the patterns have
212 been determined (explorative procedure), they will – somewhat unconventionally – only be
213 formulated when the results are discussed, and then tested immediately.

214

Method

215 Participants and procedure

216 At t_1 (Summer 2011), 134 male young football talents ($M_{Age} = 12.26$, $SD = 0.29$), who
217 were members of six regional teams of the Swiss Football Association, were recruited for the
218 study. The players took part in two tests, one year apart, in which the motivational variables
219 were ascertained by means of questionnaires. Those 97 players ($M_{Age} = 12.24$, $SD = 0.29$),
220 who took part at both measurement times, were included in the analyses. Due to missing
221 values, one subject was excluded from the data set at t_1 , and three at t_2 . One year after t_2 , the
222 selection of players for the U15 national team was used as the performance criterion. The
223 study was approved by the ethics committee of the Phil.-hum. Faculty at the University of
224 Bern.

225 Measures

226 Achievement motive.

227 To determine the achievement motive, the two components hope for success and fear of
228 failure were measured using the German version of the short scale of the *Achievement*
229 *Motives Scale – Sport (AMS-Sport)* (Wenhold, Elbe & Beckmann, 2009). Each scale consists
230 of five items, with a four-point response scale (from 0 = ‘does not apply to me at all’ to 3 =
231 ‘applies completely to me’). The internal consistencies were acceptable for group
232 comparisons, at $\alpha_{HS\ t1/t2} = .69/.76$ and $\alpha_{FF\ t1/t2} = .79/.73$

233 Achievement goal orientations.

234 The achievement goal orientations were measured using the German version (Elbe,
235 2004) of the Sport Orientation Questionnaire (SOQ) by Gill and Deeter (1988). Of the three
236 dimensions measured, the scales win (“I have the most fun when I win”) and goal orientation
237 (“I try hardest when I have a specific goal”) will be used in the current analyses. In terms of

238 their contents, these have a strong resemblance to the ego and task orientation scales (Duda,
239 1992). Each scale consists of six items, with a five-point response scale (from 1 = ‘strongly
240 disagree’ to 5 = ‘strongly agree’). The internal consistencies for this study are satisfactory at
241 both measurement points ($\alpha_{WO_{t1/t2}} = .74/.72$; $\alpha_{GO_{t1/t2}} = .66/.81$).

242 **Self-determination.**

243 Self-determination was measured using a German translation (Demetriou, 2012) of the
244 Sport Motivation Scale (SMS) by Pelletier et al. (1995). This contains seven subscales:
245 intrinsic motivation (three subscales: “to know”, “to accomplish”, “to experience”), external,
246 introjected and identified regulation, as well as amotivation. Each scale consists of four items,
247 with a seven-point response scale (from 1 = ‘does not correspond at all’ to 7 = ‘corresponds
248 exactly’). The seven subscales were combined to form a self-determination index (Vallerand,
249 2001). People with high, positive scores have a high level of self-determination. With $\alpha_{t1/t2} =$
250 $.82/.86$ the scale displayed good internal consistencies.

251 **Data analysis**

252 **LICUR method.**

253 The fundamental consequences associated with relinquishing the general linear model
254 have already been pointed out in connection with the methodological implementation of the
255 person-oriented approach. The LICUR method (**L**inking of **C**lusters after removal of a
256 **R**esidue, cf. Bergman et al., 2003) is a pattern-analytical procedure that is suitable for
257 implementing person-oriented approaches. The fundamental idea behind it is to form clusters
258 (patterns) within each developmental phase. In order to map the developmental process, the
259 individual transitions are then determined, either from the clusters of one phase to those in the
260 next phase, or to a specific developmental outcome. The LICUR method consists of three
261 steps. First, a residual analysis is carried out, in which extreme cases (residues) are identified
262 and removed from the data set, since they would distort the cluster solution. In the next step,

263 clusters are formed for the specific phases (cluster analysis). In the final step, the similarity
264 between the patterns of the different phases is determined (structural stability) and more
265 especially the developmental (anti-)types are established (individual stability). The statistical
266 methods applied in the first and second steps are based on the general linear model whereas in
267 the third step, transition probabilities between patterns or developmental outcomes are
268 determined. In other words, as suggested by the systemic development concepts, the
269 development of the motivation types is not based on linear or continuous functions. The first
270 and third steps were carried out using the statistics package SLEIPNER 2.1 (Bergman & El-
271 Khouri, 2002), while the cluster analysis was done using SPSS Statistics 20.0.

272 **Residual analysis.**

273 For the current analysis, two residues were identified both in the first (#42, #62) and in
274 the second (#9, #78) phase, which lies under the limit of 3% of the total sample proposed by
275 Bergman et al. (2003). Particularly when studying talent development, such residues can
276 provide important insights into the developmental process, since unique achievements may be
277 the result of unique developmental paths. In the present case, however, all four residues failed
278 to be selected for the U15 national team, so that a detailed analysis of these cases does not
279 seem to be warranted.

280 **Cluster analysis.**

281 Ward's method, using the squared Euclidian distance as a distance measure, was chosen
282 for the cluster analysis (Everitt, 2011), as recommended in the literature for person-oriented
283 approaches (Bergman et al., 2003; Trost & El-Khouri, 2008). The choice of the best cluster
284 solution was guided by content as well as statistical criteria. At both measurement points, the
285 stated criteria suggested a 4-cluster solution. The cluster solutions found were then subjected
286 to a cluster centre analysis. The final cluster solution displays an explained error sum of
287 squares of 47.8% at t_1 , and of 53.6% at t_2 .

311 With regard to the first question posed, four patterns are found at both measurement
312 points (cf. Figure 1). The clusters at t_1 are replicated in a similar form at t_2 . Hence there is a
313 high degree of structural stability. The distances (mean square Euclidian distance between
314 clusters) only fall in the range 0.05-0.42. Hence the same labels have been used for both
315 measurement points. The clusters are all relatively homogenous at both MTs, as reflected by
316 the low values of the homogeneity coefficients. At both measurement points, the *win-oriented*
317 *failure-fearing players* prove to be the least homogeneous cluster. Nevertheless, differences in
318 the pattern of motives – in the sense of a sharpening – are seen between t_1 and t_2 . The pattern
319 of the *average motivated players* becomes even more average, that of the *highly intrinsically*
320 *achievement-oriented players* becomes even more self-determined, and the two groups that
321 fear failure become more anxious about failing.

322 **Developmental (anti-)types**

323 Figure 2 shows the developmental (anti-)types between t_1 and t_2 . The three
324 developmental types observable between t_1 and t_2 may be seen to occur between similar, i.e.
325 structurally stable, clusters. Thus there is a higher-than-random probability that members of
326 the group of *highly intrinsically achievement-oriented players*, the *win-oriented failure-*
327 *fearing players* and the *non-achievement-oriented failure-fearing players* will continue to be
328 in the same group a year later. The two developmental antitypes occur between two dissimilar
329 clusters, suggesting that it is rare for substantial changes in the pattern of motives to occur
330 over a period of one year. In addition, certain paths are identified along which no transitions
331 have taken place; as expected, these occur between dissimilar clusters.

332 The transition probabilities between t_2 and the U15 national team are of special interest
333 in terms of the fourth question asked in this article – one that is particularly relevant to talent
334 development and selection. Based on the way in which the individual operating factors are
335 associated with performance in sports (see summary of the current research above), the cluster
336 of the *highly intrinsically achievement-oriented players* may be assumed to produce a higher-

337 than-random number of players selected for the U15 national team. By contrast, it is to be
338 assumed that players from the cluster of the *non-achievement-oriented failure-fearing players*
339 are nominated less often for the national team than chance would suggest.

340 Insert Figure 2 near here

341 Looking at the transition probabilities from t_2 to the performance criterion, the first
342 conjecture is indeed confirmed: one developmental type occurs from the cluster of the *highly*
343 *intrinsically achievement-motivated players* to the U15 national team (cf. Figure 2). In
344 addition, no transition occurs from the cluster of the *non-achievement-oriented failure-fearing*
345 *players* into the U15 national team. In view of the one-sided distribution of the number of
346 cases used for the performance criterion, this does not represent a significant deviation;
347 however as a general trend it is certainly in accordance with the hypothesis. In summary, it
348 may be stated that the pattern of *highly intrinsically achievement-oriented players* is both
349 structurally and individually stable, and is furthermore associated to a particularly high degree
350 with success in football.

351 Discussion

352 The present study was the first to use a person-oriented approach to map the
353 motivational subsystem of young football talents and to investigate by non-linear means how
354 this subsystem is related to sports success. In doing so, four clusters were identified, which
355 were structurally stable over a period of one year. The high individual stability between twin
356 clusters suggests that in most players there are no fundamental changes in the motivational
357 subsystem. This agreement between the structural and the individual stability suggests that the
358 motivational system is relatively stable over this time period, which indicates a certain
359 selection relevance in the actual process of talent selection.

360 Overall, most of the developmental types identified were in line with expectations. High
361 levels of win and goal orientation, hope for success and self-determination are associated, not

362 only individually but also collectively, with greater success and accordingly with higher
363 performance in sports. Hence a range of different interactions appear to exist, as well as
364 various means of compensation between different variables as assumed by talent research
365 (Meylan et al., 2010). Similar means of compensation are seen in the paths between the
366 clusters identified at t_2 and the performance criterion. While players with the highest
367 probability of transition into the top level of performance (Cluster 2-1) display – in terms of
368 performance – favourable scores on all operating factors; no developmental types are found to
369 lead from Clusters 2-2 and 2-3 – characterised by one or two variables scoring on a below-
370 average level – to the top level of performance. Individual players with such patterns of
371 motives are in fact nevertheless selected for the U15 national team. This suggests that
372 individual motivational weaknesses do not in themselves necessarily have a negative effect on
373 success or performance development. However, if all the variables of the motivational
374 subsystem are unfavourable, the overall system state does seem to impair performance. This
375 is demonstrated by the fact that not a single *non-achievement-oriented failure-fearing player*
376 was selected for the national team. Conclusions of this kind cannot be drawn on the basis of
377 variable-oriented analyses, pointing out the added value of the person-oriented approach that
378 has been adopted here.

379 The following critical issues must be taken into consideration as regards the study
380 conducted: Firstly, the holistic approach chosen has only been partially implemented by this
381 study in looking at the motivational subsystem. A truly holistic systemic examination of
382 talented football players would have to also consider further psychological and performance-
383 determining variables from other dimensions, such as motor skills and environmental
384 circumstances (Williams & Franks, 1998). For reasons of research economy, however, it is
385 simply not possible to consider the entire person-environment system empirically in holistic
386 terms, which is why it has become accepted practice to confine oneself to individual
387 subsystems (cf. Bergman & Magnusson, 1997; Trost & El-Khoury, 2008; Zibung

388 & Conzelmann, 2013). Secondly, when interpreting the patterns identified, it should not be
389 forgotten that the sample produced extremely high scores for the individual variables. Hence
390 the term “below-average” merely refers to the scores after being adjusted through z-
391 standardisation of the comparative sample, not to the absolute scores.

392 Future longitudinal studies should check to what extent the identified clusters are also
393 found in other sports and in other stages of development, and whether they are also associated
394 with longer-term success in sports. While the nomination for the U15 national team is a
395 highly relevant criterion for top-class football in Switzerland, it is not able to predict
396 deterministically the level of success at the age of peak performance. If the motivational
397 patterns can be shown to predict success longitudinally too, they might in future be used in
398 talent selection.

399 Despite these limitations, the results of this study indicate that an achievement-oriented
400 motivational attitude which is also expressed phenotypically has a significant influence on the
401 selection decisions of national coaches and is therefore an important talent criterion.

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References

- 404 Abbott, A., & Collins, D. (2004). Eliminating the dichotomy between theory and practice in
405 talent identification and development: Considering the role of psychology. *Journal of*
406 *Sports Sciences*, 22(5), 395–408.
- 407 Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning
408 strategies and motivation processes. *Journal of Educational Psychology*, 80(3), 260–267.
- 409 Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological*
410 *Review*, 64(6), 359–372.
- 411 Auweele, Y. V., Cuyper, B. D., Mele, V. V., & Rzewnicki, R. (1993). Elite performance and
412 personality: From description and prediction to diagnosis and intervention. In R. N. Singer,
413 M. Murphey, & L. K. Tennant (Eds.), *Handbook of research on sport psychology* (2nd ed.,
414 pp. 257–292). New York: Macmillan Publishing Company.
- 415 Bergman, L. R., & Andersson, H. (2010). The person and the variable in developmental
416 psychology. *Journal of Psychology*, 218(3), 155–165.
- 417 Bergman, L. R., & El-Khoury, B. M. (2002). *SLEIPNER - a statistical package for pattern-*
418 *oriented analyses: User Manual*. Unpublished manuscript, Stockholm University.
- 419 Bergman, L. R., & El-Khoury, B. M. (2003). A person-oriented approach: Methods for today
420 and methods for tomorrow. *New Directions for Child and Adolescent Development*, 101,
421 25–38.
- 422 Bergman, L. R., & Magnusson, D. (1997). A person-oriented approach in research on
423 developmental psychopathology. *Development and Psychopathology*, 9, 291–319.
- 424 Bergman, L. R., Magnusson, D., & El-Khoury, B. M. (2003). *Studying individual development*
425 *in an interindividual context: A person-oriented approach. Paths through life: Vol. 4.*
426 Mahwah, N.J: Erlbaum.

427 Biddle, S., & Brooke, R. (1992). Intrinsic versus extrinsic motivational orientation in physical
428 education and sport. *British Journal of Educational Psychology*, 62(2), 247–256.

429 Boiché, J. C., Sarrazin, P. G., Grouzet, F. M., Pelletier, L. G., & Chanal, J. P. (2008).
430 Students' motivational profiles and achievement outcomes in physical education: A self-
431 determination perspective. *Journal of Educational Psychology*, 100(3), 688–701.

432 Brunstein, J. C., & Heckhausen, H. (2010). Achievement motivation. In J. Heckhausen & H.
433 Heckhausen (Eds.), *Motivation and action* (1st ed., pp. 137–183). Cambridge: Cambridge
434 University Press.

435 Calvo, T. G., Cervello, E., Jimenez, R., Iglesias, D., & Murcia, J. A. (2010). Using self-
436 determination theory to explain sport persistence and dropout in adolescent athletes.
437 *Spanish Journal of Psychology*, 13(2), 677–684.

438 Chantal, Y., Guay, F., Dobрева-Martinova T., & Vallerand, R. J. (1996). Motivation and elite
439 performance: An exploratory investigation with Bulgarian athletes. *International Journal*
440 *of Sport Psychology*, 27, 173–182.

441 Coetzee, B., Grobbelaar, H. W., & Gird, C. C. (2006). Sport psychological skills that
442 distinguish successful from less successful soccer teams. *Journal of Human Movement*
443 *Studies*, 51(6), 383–401.

444 Conroy, D. E., Elliot, A. J., & Coatsworth, J. D. (2007). Competence motivation in sport and
445 exercise: The hierarchical model of achievement motivation and self-determination theory.
446 In M. Hagger & N. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in*
447 *exercise and sport* (pp. 181–192). Champaign: Human Kinetics.

448 Conzelmann, A. (2001). *Sport und Persönlichkeitsentwicklung. Möglichkeiten und Grenzen*
449 *von Lebenslaufanalysen* [Sports and personality development. Opportunities and limitations of
450 life course analyses]. Schorndorf: Hofmann.

- 451 Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human*
452 *behavior*. New York: Plenum.
- 453 Demetriou, Y. (2012). *Health promotion in physical education: Development and evaluation*
454 *of the eight week PE programme "HealthyPEP" for sixth grade students in Germany*.
455 Forum Sportwissenschaft: Vol. 25. Hamburg: Czwalina.
- 456 Duda, J. L. (1992). Motivation in sport settings: A goal perspective approach. In G. C.
457 Roberts (Ed.), *Motivation in sport and exercise*. Champaign, Ill.: Human Kinetics Books.
- 458 Duda, J. L. (1993). Goals: A social-cognitive approach to the study of achievement
459 motivation in sport. In R. N. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of*
460 *research on sport psychology* (2nd ed., pp. 421–436). New York: Macmillan Publishing
461 Company.
- 462 Elbe, A., & Wenhold, F. (2005). Cross-cultural test-control criteria for the achievement
463 motives scale-sport. *International Journal of Sport and Exercise Psychology*, 3(2), 163–
464 177.
- 465 Elbe, A.-M. (2004). Testgütekriterien der deutschen Version des Sport Orientation
466 Questionnaires [Psychometric properties of the German version of the Sport Orientation
467 Questionnaire]. *Spectrum der Sportwissenschaft*, 16(1), 96–107.
- 468 Elbe, A.-M., & Beckmann, J. (2006). Motivational and self-regulatory factors and sport
469 performance in young elite athletes. In D. Hackfort & G. Tenenbaum (Eds.), *Essential*
470 *processes for attaining peak performance* (pp. 137–157). Aachen: Meyer & Meyer Sport.
- 471 Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance
472 achievement motivation. *Journal of Personality and Social Psychology*, 72(1), 218–232.
- 473 Everitt, B. S. (2011). *Cluster analysis* (5th ed.). Chichester: Wiley-Blackwell.
- 474 Fisher, R. (Ed.) (2008). *Talent identification and development: The search for sporting*
475 *excellence*. Berlin: ICSSPE.

- 476 Gill, D. L., & Deeter, T. E. (1988). Development of the Sport Orientation Questionnaire.
477 *Research Quarterly for Exercise and Sport*, 59(3), 191–202.
- 478 Gillet, N., Vallerand, R. J., Amoura, S., & Baldes, B. (2010). Influence of coaches' autonomy
479 support on athletes' motivation and sport performance: A test of the hierarchical model of
480 intrinsic and extrinsic motivation. *Psychology of Sport and Exercise*, 11(2), 155–161.
- 481 Gillet, N., Vallerand, R., & Rosnet, E. (2009). Motivational clusters and performance in a
482 real-life setting. *Motivation and Emotion*, 33(1), 49–62.
- 483 Halvari, H., & Thomassen, T. O. (1997). Achievement motivation, sports-related future
484 orientation, and sporting career. *Genetic Social and General Psychology Monographs*,
485 123(3), 343–365.
- 486 Halvari, H., & Thomassen, T. O. (1997). Achievement motivation, sports-related future
487 orientation, and sporting career. *Genetic Social and General Psychology Monographs*,
488 123(3), 343–365.
- 489 Heckhausen, J., & Heckhausen, H. (2010). Motivation and development. In J. Heckhausen &
490 H. Heckhausen (Eds.), *Motivation and action* (1st ed., pp. 384–443). Cambridge:
491 Cambridge University Press.
- 492 MacNamara, A., Button, A., & Collins, D. (2010). The role of psychological characteristics in
493 facilitating the pathway to elite performance: Part 1: Identifying mental skills and
494 behaviors. *The Sport Psychologist*, 24, 52–73.
- 495 Magnusson, D. (1990). Personality development from an interactional perspective. In L. A.
496 Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 193–222). New York,
497 NY: Guilford Press.
- 498 Magnusson, D., & Cairns, R. B. (1996). Developmental science: Toward a unified
499 framework. In R. B. Cairns, G. H. Elder, & E. J. Costello (Eds.), *Developmental science*
500 (pp. 7–30). Cambridge: University Press.

501 Magnusson, D., & Stattin, H. (2006). The Person in context: A holistic-interactionistic
502 approach. In W. Damon (Ed.), *Handbook of child psychology* (6th ed., pp. 400–464).
503 Hoboken, N.J., Chichester: Wiley; John Wiley.

504 McNeill, M. C., & Wang, C. K. (2005). Psychological profiles of elite school sports players in
505 Singapore. *Psychology of Sport and Exercise*, 6(1), 117–128.

506 Meylan, C., Cronin, J., Oliver, J., & Hughes, M. (2010). Talent identification in soccer: The
507 role of maturity status on physical, physiological and technical characteristics.
508 *International Journal of Sports Science & Coaching*, 5(4), 571–592.

509 Nicholls, J. G. (1984). Achievement motivation: conceptions of ability, subjective experience,
510 task choice, and performance. *Psychological Review*, 91(3), 328–346.

511 Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations Among
512 Perceived Autonomy Support, Associations among perceived autonomy support, forms of
513 self-regulation, and persistence: A prospective study. *Motivation and Emotion*, 25(4), 279–
514 306.

515 Pelletier, L. G., Tuson, K. M., Fortier, M. S., Vallerand, R. J., Briere, N. M., & Blais, M. R.
516 (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and
517 amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport & Exercise*
518 *Psychology*, 17(1), 35–53.

519 Régnier, G., Salmela, J., & Russell, S. J. (1993). Talent detection and development in sport. In
520 R. N. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of research on sport*
521 *psychology* (2nd ed., pp. 290–313). New York: Macmillan Publishing Company.

522 Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to
523 talent identification in soccer. *Journal of Sports Sciences*, 18, 695–702.

524 Ryan, R. M., & Deci, E. L. (2007). Active human nature: Self-determination theory and the
525 promotion and maintenance of sport, exercise, and health. In M. Hagger & N.

526 Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp.
527 1–19). Champaign: Human Kinetics.

528 Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic
529 motivation, and well-being. *American Psychologist*, *55*(1), 68–78.

530 Sagar, S. S., Busch, B. K., & Jowett, S. (2010). Success and failure, fear of failure, and coping
531 responses of adolescent academy football players. *Journal of Applied Sport Psychology*,
532 *22*(2), 213–230.

533 Sarrazin, P., Vallerand, R., Guillet, E., Pelletier, L., & Cury, F. (2002). Motivation and
534 dropout in female handballers: A 21-month prospective study. *European Journal of Social*
535 *Psychology*, *32*(3), 395–418.

536 Trost, K., & El-Khoury, B. M. (2008). Mapping Swedish females' educational pathways in
537 terms of academic competence and adjustment problems. *Journal of Social Issues*, *64*(1),
538 157–174.

539 Unierzyski, P. (2003). Level of achievement motivation of young tennis players and their
540 future progress. *Journal of Sport Science and Medicine*, *2*, 184–186.

541 Vallerand, R. J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and
542 exercise. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263–
543 319). Champaign, IL: Human Kinetics.

544 van Rossum, J., & Gagné, F. (2006). Talent development in sports. In F. A. Dixon & S. M.
545 Moon (Eds.), *The handbook of secondary gifted education* (pp. 281–316). Waco, Tex:
546 Prufrock Press.

547 Wenhold, F., Elbe, A.-M., & Beckmann, J. (2009). *Achievement Motives Scale - Sport (AMS-*
548 *Sport). Fragebogen zum Leistungsmotiv im Sport: Manual* [Achievement Motives Scale –
549 Sport (AMS–Sport). Questionnaire on the achievement motive in sports: Manual]. Bonn:
550 Bundesinstitut für Sportwissenschaft.

- 551 Williams, A. M., & Franks, A. (1998). Talent identification in soccer. *Sports Exercise and*
552 *Injury*, 4(4), 159–165.
- 553 Zibung, M., & Conzelmann, A. (2013). The role of specialisation in the promotion of young
554 football talents: A person-oriented study. *European Journal of Sport Science*, 13(5), 452–
555 460.
- 556 Zuber, C., & Conzelmann, A. (2013). The impact of the achievement motive on athletic
557 performance in adolescent football players. *European Journal of Sport Science*. Advance
558 online publication. doi: 10.1080/17461391.2013.837513

Table 1

Descriptive Statistics for the Operating Factors

	Operating factors									
	Win orientation (Range 1-5)		Goal orientation (Range 1-5)		Hope for success (Range 0-4)		Fear of failure (Range 0-4)		Self-determination (Range 18-18)	
	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>
Measuring point 1										
Total (<i>n</i> =94)	4.17	0.67	4.71	0.37	2.43	0.48	0.60	0.60	9.32	2.60
Cluster 1-1 (<i>n</i> =29)	4.63	0.38	4.91	0.14	2.84	0.27	0.14	0.27	10.41	1.84
Cluster 1-2 (<i>n</i> =26)	4.57	0.42	4.82	0.20	2.10	0.49	1.03	0.71	7.50	2.98
Cluster 1-3 (<i>n</i> =20)	3.49	0.43	4.88	0.16	2.40	0.39	0.47	0.37	10.85	1.80
Cluster 1-4 (<i>n</i> =19)	3.63	0.53	4.10	0.25	2.26	0.35	0.84	0.43	8.50	1.97
	Win orientation		Goal orientation		Hope for success		Fear of failure		Self-determination	
Measuring point 2	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>
Total (<i>n</i> =92)	4.34	0.57	4.73	0.39	2.39	0.51	0.63	0.57	9.39	2.44
Cluster 2-1 (<i>n</i> =33)	4.56	0.41	4.92	0.15	2.84	0.23	0.22	0.27	11.43	1.40
Cluster 2-2 (<i>n</i> =20)	4.82	0.22	4.84	0.23	2.39	0.44	1.22	0.57	8.42	2.51
Cluster 2-3 (<i>n</i> =26)	3.95	0.48	4.76	0.31	2.17	0.36	0.47	0.39	9.08	1.54
Cluster 2-4 (<i>n</i> =13)	3.79	0.57	4.03	0.38	1.71	0.31	1.08	0.31	6.30	1.29

The cluster are numbered such that the first digit denotes the time of the measurement and the digit after the hyphen denotes the number of the cluster within that phase, going from 1 to 4.

Figure 1. z-standardised motive patterns for the clusters identified at times t_1 and t_2 . Operating factors:

1 = Win orientation; 2 = Goal orientation; 3 = Hope for success; 4 = Fear of failure; 5 = Self-determination

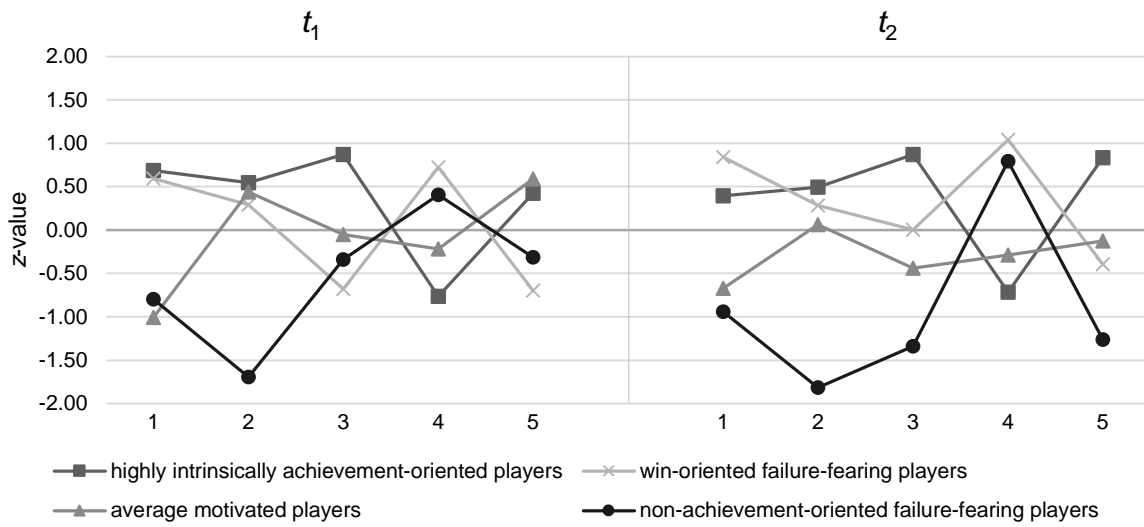
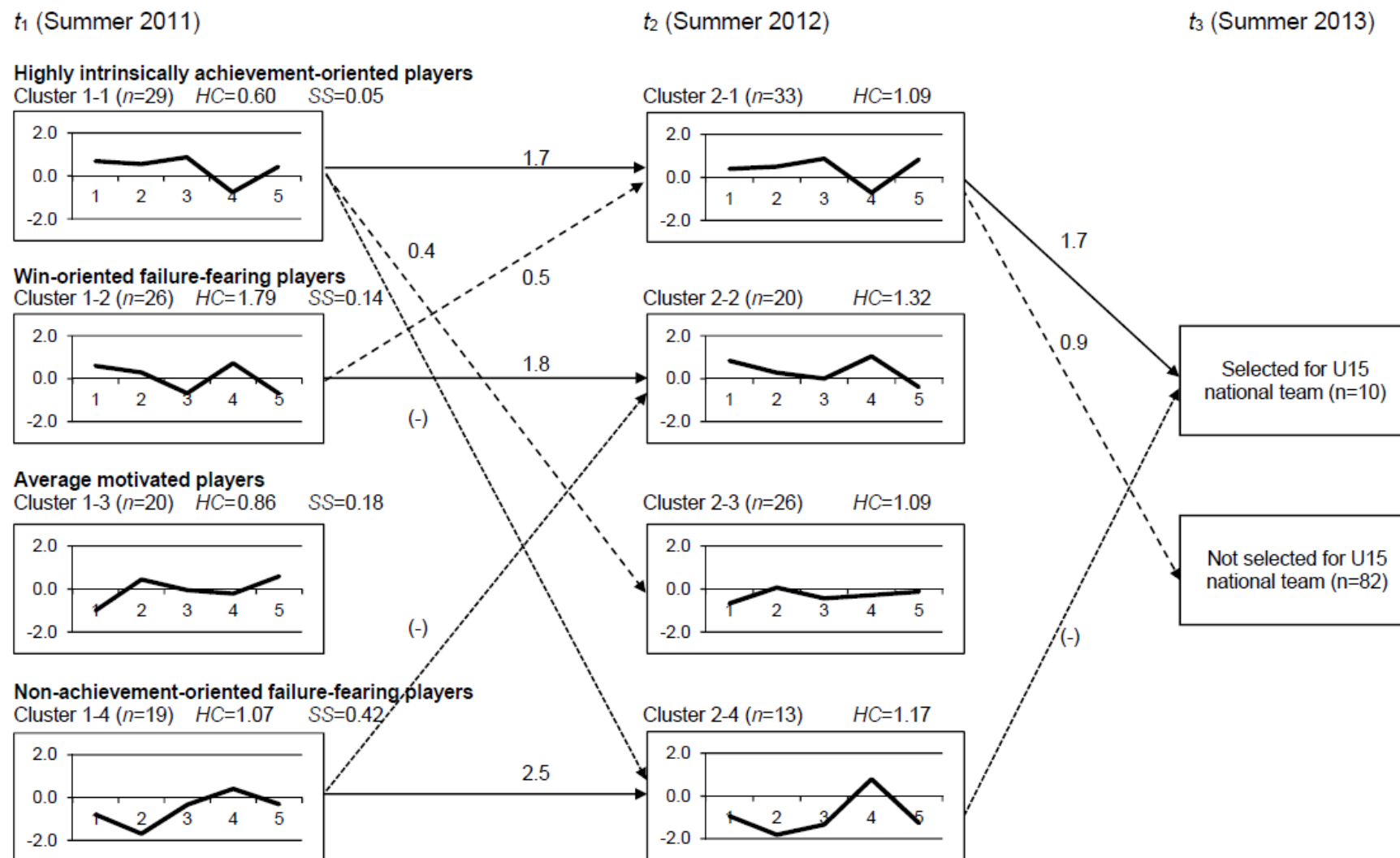


Figure 2. z-score profiles of the clusters (cluster centroids) and developmental (anti-)types for t_1 and t_2 and selection for the U15 national team.



Operating factors:
 1 = Win orientation
 2 = Goal orientation
 3 = Hope for success
 4 = Fear of failure
 5 = Self-determination

HC = Homogeneity coefficient (mean square Euclidian distance within the cluster)

The numbers next to the arrows represent the odds ratios and hence indicate by how much the probability of this development path is increased or decreased

—→ Developmental type
 - - - → Developmental anti-type
 ····· → No transitions (-)

SS = Structural stability (mean square Euclidian distance between twin clusters (= clusters on same level))