

Running head: EXAMINING THE ECOLOGICAL VALIDITY

Examining the Ecological Validity of the Talent Development Environment Questionnaire

Russell J.J. Martindale

Edinburgh Napier University, School of Life, Sport and Social Sciences, Edinburgh,

UK

Dave Collins

University of Central Lancashire/Grey Matters Consultants, UK

Carl Douglas

PBPerformance, UK

Ally White

Scottish Swimming, National Swimming Academy, Stirling, UK

Date of Submission: 25th June 2012

Correspondence concerning this article should be addressed to:

Russell J.J. Martindale

School of Life, Sport and Social Sciences

Edinburgh Napier University

Sighthill Campus, Sighthill Court

Edinburgh

EH11 4BN

Email: r.martindale@napier.ac.uk

Abstract

It is clear that high class expertise and effective practice exists within many talent development environments across the world. However, there is also a general consensus that wide-spread evidence based policy and practice is lacking. As such, it is crucial to develop solutions which can facilitate effective dissemination of knowledge and promotion of evidence based talent development systems. While the Talent Development Environment Questionnaire (Martindale et al., 2010) provides a method through which this could be facilitated, its ecological validity has remained untested. As such, this study aimed to investigate the real world applicability of the questionnaire through discriminant function analysis. Athletes across ten distinct regional squads and academies were identified and separated into two broad levels, 'higher quality' (n=48) and 'lower quality' (n=51) environments, based on their process quality and productivity. Results revealed that the Talent Development Environment Questionnaire was able to discriminate with 77.8% accuracy. Furthermore, in addition to the questionnaire as a whole, two individual features, 'quality preparation' ($p<0.01$) and 'understanding the athlete' ($p<0.01$), were found to be significant discriminators. In conclusion, the results indicate robust structural properties and sound ecological validity, allowing the questionnaire to be used with more confidence in applied and research settings.

Examining the Ecological Validity of the Talent Development Environment Questionnaire

Development of sporting talent is high on the agenda of many governing bodies, across many different countries. Currently, perhaps none more so than for UK Sport, the body in charge of the GB Olympic and Paralympic programmes leading into London 2012. The need to develop effective, evidence based development environments is crucial in the years leading into a specific Olympics, and any mechanism which can help to bridge the theory-practice gap could be extremely valuable. Unfortunately, however, while there are useful descriptive studies that highlight pockets of effective talent development expertise (e.g. Henriksen, Stambulova & Rössler, 2010), the lack of wide-spread evidence based policy and practice has been recognised (Bailey, Collins, Ford, MacNamara, Toms, & Pearce, 2009). Furthermore, “general consensus is that the translation of sports science research to practice is poor” (Bishop, 2008, p. 253). This makes the barriers and potential solutions associated with effective dissemination and use of evidence based practice an even more pertinent issue.

Recognising this problem, Martindale, Collins, Wang, McNeill, Sonk Lee, Sproule, and Westbury (2010) developed the Talent Development Environment Questionnaire with the aim of facilitating evaluation, dissemination, and use of key processes that had been recognised through research as being important for successful talent development. While the effectiveness of talent development environments and/or coaches must ultimately be measured by the number of athletes that are developed successfully through the system, using this outcome measure alone does little more than, at best, identify where good practice *might* occur. Of course, this also

assumes talent is equally and randomly distributed amongst coaches and environments.

To provide some context to the Talent Development Environment Questionnaire, four important areas that consistently emerged from the literature formed the foundations of its development, 1) Long term aims and methods; 2) Wide ranging, coherent messages and support; 3) Emphasis on development not early 'success'; and 4) Individualised and ongoing development (c.f., Martindale, Collins, & Daubney, 2005). While these features emerged from the consideration of a wide breadth of literature, and talent development research continues to progress, it is beyond the scope of this paper to provide an overview of the talent development literature to date. The subsequent questionnaire development process and exploratory factor analysis (for more detail see Martindale et al., 2010) revealed a 7-factor structure that was investigated in this study. This included 1) 'Long term development focus' - related to the degree to which development opportunities afforded to athletes were specifically designed to facilitate long term success; 2) 'Quality preparation' - related to the extent to which clear guidance and opportunities are in place to provide and reinforce quality practice through training, recovery and competition experiences; 3) 'Communication' - related to the extent to which the coach communicates effectively with the athlete in both formal and informal settings; 4) 'Understanding the athlete' - related to the extent to which the coach understands the athlete at a holistic level, and has developed a strong professional relationship with them; 5) 'Support network' - related to the extent to which a coherent, approachable and wide ranging support network is available to help support and develop the athlete in all areas; 6) 'Challenging and supportive environment' - related to the extent to which athletes are challenged appropriately by development experiences and supported

through them; and finally 7) 'Long term development fundamentals' - related to the extent to which key features of the foundations for further development are considered; for example, ongoing opportunities, avoidance of early specialisation, parental support, and athlete autonomy.

Given this context, the development of the Talent Development Environment Questionnaire has potential to help facilitate the effective dissemination of knowledge and aid the evaluation and monitoring of practice, utilising evidence based process measures. However, while Martindale et al., (2010) outline the development of the questionnaire, along with rationale and evidence for its content and structure, its ecological validity remains un-examined. This is important because, without an assessment of the real world use of the questionnaire, it is difficult to judge the extent of its applicability. Furthermore, such testing forms a crucial part of the assessment of the psychometric properties of any questionnaire (Criterion Validity: Thomas & Nelson, 1999). As such, this piece of work presents an investigation of ten differently rated talent development environments in order to examine the extent and nature of the ecological validity of the questionnaire in real world settings.

Methods

Classification of Quality Talent Development Environments – Rationale and Process

Ten environments were selected and assigned to either 'higher quality' or 'lower quality' categories by suitably qualified, knowledgeable and independent assessors from each sport before data collection began. These 'judges' included a Director of Performance and a Governing Body representative, both with more than 20 years experience in their respective sports. Both had been in charge of setting up either all or some of the development centres involved and as such had thorough knowledge of their day to day activities, their productivity, and quality of talent base.

This process provided the rationale and evidence for grading environments within each sport, with evaluations based on both process quality and outcome.

With regard to evaluations of process, we specifically used individuals who had responsibility for establishing, developing and managing the centres. The downside of using judges 'internal' to the organisation is the potential for bias, most likely towards those centres who were most faithfully confirming to the judges' own 'central plan'. But of course, this is the aim in the context of sport run talent development systems. From a process point of view, the centres were graded, at least in part, by those best placed to judge their adherence to this process. The authors felt that neutral judges would have made decisions on the information presented rather than a deeper personal knowledge, but also displaying equal levels of 'bias' towards their own schematic models of optimum talent development. As such, judgements were made by those best informed about and responsible for the respective systems. From an outcome point of view, we stressed the 'long term' output of the centres as the most important criteria: in short, how many young athletes were progressed up the pathway to senior status and performance, rather than the more immediate success at junior age which is more typically employed. Where statistics on this criterion were available, these are included in the paper; when formally unavailable, centre outcome was used as an explicit criterion.

'Sport One' (swimming) accounted for three 'higher quality' and three 'lower quality' environments associated with regional squads. These groups were separated based on rationale presented by 'expert judges' relating to the identification of the set up quality of particular regions. This included specific reference to progression rates (the outcome criterion) and centrally prescribed process markers such as the

employment of professional coaches to develop the talent personally, organise and educate regional coaches and run the regional programmes.

‘Sport Two’ (rugby) presented two ‘higher quality’ and two ‘lower quality’ academy environments; judgement criteria included data of through put of academy players into senior representation since 2002 (see Table 1), supplemented by the expert opinion of the assessor based on each centre’s adherence to the National Governing Body’s central process plan for academies. In all, ten talent development environment ‘groups’ were identified by the assessors within the two sports (one individual and one team sport, mixed gender and male respectively), five of which were classified as ‘higher quality’ and five classified as ‘lower quality’ standard.

INSERT TABLE 1 ABOUT HERE

Participant Selection and Recruitment

The process above yielded the recruitment of 99 developing athletes at junior elite level to take part in this validation study. Forty-eight of them were identified to belong to a ‘higher quality’ environment (11 rugby; 37 swimming) and 51 to a ‘lower quality’ environment (13 rugby; 38 swimming). This sample size is adequate as the minimum number of cases per group needs to exceed 20 (Tabachnick & Fidell, 2001). Sixty-three males and 36 females aged between 11 and 21 ($M = 14.1$ $SD = 2.67$) were involved in this investigation. One individual sport (swimming) and one team sport (rugby) were intentionally sampled to enable a wider diversity of development environments to be examined, in keeping with the generic nature of the Talent Development Environment Questionnaire.

Procedure

Ethical clearance was obtained, and once the relevant permission was granted, access was provided for the researchers to attend regional camps and visit academies

specifically to ask consenting participants to fill out the questionnaire. Participants were provided with a standard set of instructions by the researchers to encourage honesty and concentration. Specifically, the participants were told that the questionnaire was designed to gain insight into their sport development experiences. They were informed that the questionnaire would take approximately 15 minutes to fill out, and that their answers would remain fully anonymous. No information provided could be attributable to them individually. Furthermore, they were asked to answer the questionnaire as honestly as possible, as this may help to develop the questionnaire into a useful tool to improve the quality of their development experience. Finally, participants were told that they could withdraw from the study at any time without question or consequence.

Instrument

The Talent Development Environment Questionnaire (Martindale et al., 2010) is a 59 item questionnaire designed to measure the extent to which certain features of good practice are experienced by athletes in their development environments. The instrument measures seven features including 1) Long term development focus (24 items); 2) Quality preparation (5 items); 3) Communication (7 items); 4) Understanding the athlete (4 items); 5) Support network (8 items); 6) Challenging and supportive environment (4 items); and finally 7) Long term development fundamentals (7 items). Examples of the types of questions asked include ‘My coach is good at helping me to understand what I am doing and why I am doing it’ and ‘I regularly set goals with my coach that are specific to my individual development’. Answers for all the 59 items were given on a 6-point scale ranging from 1 (strongly agree) to 6 (strongly disagree). Finally, the internal consistency of the questionnaire show adequate to excellent reliability (Tabachnick & Fidell, 2001). Specifically,

Cronbach's Alpha for Factor 1 to Factor 7 respectively scoring .978; .616; .913; .730; .899; .618; .881.

Data Analysis

The discriminant validity of the questionnaire was examined through a multivariate analysis of variance, subsequent univariate statistics and a discriminant function analysis. The initial multivariate analysis of variance has been said to 'protect' from subsequent analysis of variance tests, because it avoids inflating the chance of type 1 errors through repeated tests (Bock, 1975). As such, it is advised to utilise both analysis of variance and discriminant function analysis to fully understand the data (Field, 2006). Normal assumptions for multivariate analysis of variance apply to discriminant function analysis. The discriminant function analysis entered the predictors together, as opposed to in a stepwise fashion due to it being used to follow up a multivariate analysis of variance, utilising observed group sizes (Field, 2006).

Results

Preliminary analysis using the multivariate analysis of variance confirmed that there was a significant difference between the two groups ($F(90, 8) = 6.789, p < .0001$) in their overall scores for the Talent Development Environment Questionnaire, ('Higher Quality': $M=2.54, SD =0.52$; 'Lower Quality': $M=2.78, SD=0.60$). The results from the multivariate analysis of variance and subsequent univariate tests are presented in Table 2. Specifically, mean scores, standard deviations, associated effect sizes and significance values for individual questionnaire factors between the 'higher quality' and 'lower quality' environments are presented. Furthermore, the canonical variate correlation coefficients are also presented in Table 2. These are comparable to factor loadings and indicate substantive nature of the variates, where high correlations contribute most to group separation (Bargman, 1970). Please note that due to the

structure of the likert scale of the questionnaire, a low score relates to a perception of higher quality experiences.

INSERT TABLE 2 ABOUT HERE

The overall Talent Development Environment Questionnaire scores revealed significant differences between the 'higher quality' and 'lower quality' groups, with two of the individual factors taking a significant role in discrimination. These were, Factor 2 'Quality preparation', which relates to the extent to which quality competition, training and recovery is available; the nature of peer ethos; and the clarity of progression requirements. Secondly, there was a significant difference in Factor 4 'Understanding the athlete'. This factor relates to the extent to which the coach builds a good athlete-coach relationship and considers the athlete from a holistic life perspective; facilitates mental toughness and communicates with significant others. Interestingly, while these two factors revealed significant differences, a further three of the seven factors showed positive trends with small effect sizes (albeit statistically non-significant) in the favour of the 'higher quality' environments. These three factors included Factors 1 'Long term development focus', Factor 3 'Communication', and Factor 7 'Long term development fundamentals'.

Finally, the discriminant function analysis determined the ability of the questionnaire to predict the environment to which the athletes belonged. Given the expected unequal group sizes, a priori probabilities for each group were calculated from the outcome group size. The result indicated a significant discriminant function (Wilks's Lambda = 0.624, $X^2(2) = 43.91$, $p < .001$) and a canonical correlation of 0.613. The seven questionnaire factors were able to correctly predict 77.8% of the players into the correct quality environment (Table 3).

INSERT TABLE 3 ABOUT HERE

Discussion

Introduction

The Talent Development Environment Questionnaire was developed by Martindale et al. (2010) in response to the need to facilitate evidence based practice within talent development environments. While it was shown to have strong structural properties (Martindale et al., 2010), the nature of its ecological validity was untested. As such, this investigation aimed to provide insight into its real world applicability. Typically, work examining the ecological and criterion validity of questionnaires is usefully done through discriminant function analysis (Raylu & Oei, 2004). In this case, the analysis presented evidence for the extent to which the questionnaire can discriminate between effective and less effective practice in real world applied settings. This provided insight, both in terms of its ability to correctly identify different qualities of environments, but also the importance of each of the individual features of the questionnaire in the discrimination process.

Predictive Qualities and Role of Individual Factors

Results found that the questionnaire was predictive with 77.8% accuracy, which provides evidence for its potential and relevance as an applied tool. Furthermore, differences between the relative importance of individual features also emerged, perhaps highlighting the extent to which different factors are important for successful environments.

Specifically, two items showed a significant difference between the two levels - Factor 2: 'Quality preparation' and Factor 4: 'Understanding the athlete'. Their stand-out importance may be due to a number of reasons. While it is impossible to speculate accurately without further investigation, there are many obvious and significant benefits to providing an environment which facilitates 'quality

preparation', for example, there is a clear link between this and successful development and performance outcomes (e.g., Abbott & Collins, 2002; Bloom, 1985; Button, MacMahon, & Masters, 2011; Cote, 1999; Ericsson et al., 1993; Janelle & Hillman, 2003). Furthermore, the difficulty of setting up an appropriate balance and reinforcement of quality competition, training and recovery ethos consistently over time is clear, and as such perhaps holds high potential for growth in many environments (Douglas & Martindale, 2008). Additionally, given the complex nature of talent development, the possibility of conflicting demands and the involvement of many significant others (Collins, 2008), the features mentioned above, in conjunction with clarity of progression requirements and sound planning for potential obstacles, if done well, is likely to provide significant and observable benefits.

With regards to 'Understanding the athlete', the nature of development has been shown to be emergent and consistently challenging at a highly individualised level (Abbott, Button, Pepping, & Collins, 2005; Bloom, 1985; Gould, Dieffenbach, & Moffett, 2002; Simonton, 1999). Indeed, successful performance and 'talent' itself has been shown to be a highly individual concept, where strengths compensate for weaknesses in idiosyncratic ways (Bartmus, Neumann, & De Mare'es, 1987). As such, the more effectively coaches understand their athletes on an individual and holistic level, facilitate mental toughness and communicate with significant others, the more likely a successful talent development journey will follow (Bloom, 1985; Gould et al., 2002).

The two factors outlined above, when combined, link closely with the importance of an appropriate 'ethos' evident in eminent research such as Bloom (1985) and Csikszentmihalyi, Whalen, Wong, & Rathunde (1993). The provision of such consistent reinforcement and individualised attention through pathway and

communication structures is challenging, but may be particularly powerful when implemented successfully. Indeed, it has been shown that prioritising an individual approach is difficult to resource successfully (Douglas & Martindale, 2008).

However, it is important to highlight that while only two of the factors showed significant differences between the groups, the extent of the non-significant findings are perhaps unsurprising, given that all of the factors reflect structural or selection-related features, and all environments tested were 'endorsed and directed' by the respective National Governing Bodies. In short, even the weaker environments may not have been that weak. Furthermore, given the relatively small numbers of participants and environments examined, in addition to their status as 'approved' centres, and with consideration of the large amount of qualitative and empirical support for all the factors (c.f. Martindale et al., 2010), this finding needs to be applied with caution.

Building on this, while only Factor 2 (Quality preparation) and Factor 4 (Understanding the athlete) stood out statistically, three other features also appeared to 'add value' to the discrimination, evident through positive effect sizes and relatively larger canonical variate correlation coefficients compared to the other factors. These included 'Long term development focus', 'Communication', and 'Long term development fundamentals', all of which have ample empirical evidence for their importance (e.g. Baker, Côté, & Abernethy, 2003; Bloom, 1985; Côté, 1999; Côté & Fraser-Thomas 2007; Ericsson, Krampe, & Tesch-Romer, 1993; Gould et al., 2002; Macphail & Kirk 2006). While this early evidence leads to the possibility of revealing relatively 'more important' features, careful consideration is clearly needed. Even so, the results demonstrate that the questionnaire has good ecological validity,

and as such, can be used with more confidence. With this in mind, it is worth outlining some areas for potential use, both in research and applied work.

Implications for Application and Research

From an applied perspective, the questionnaire can be used to educate and disseminate knowledge regarding key generic features of effective practice (Kitson, Harvey, & McCormack, 1998). With sound consideration of important issues such as impression management (Buckley & Williams, 2002), it could be used to provide an evidenced basis for formative evaluation, feedback, and reflective practice (Chivers & Darling, 1999). Leading on from this, it could be used to monitor and reinforce changes to development procedures (Siedentop, 1978), gain insight into athlete perceptions and understanding (Morgan, Kingston, & Sproule, 2005), or clarify expectations (Leary, 1996). Furthermore, it is strongly recommended that the tool should be used formatively in applied settings, utilising both quantitative and qualitative feedback, considering individual items as well as 'factor' and 'overall' scores. Finally, the development of resources and training to be utilised alongside the questionnaire would be an important next step in improving the likelihood of facilitating evidence based practice effectively.

From a research perspective, there are still many unanswered questions. For example, while the results indicate that two (or perhaps five) of the factors may hold a special and important role within the development process, they may not necessarily be all encompassing. This clearly warrants further exploration and future work would usefully focus on examining which Talent Development Environment Questionnaire features are most relevant for helping talented individuals get to and produce at a world class level.

Furthermore, the context specific nature of the questionnaire still warrants further investigation. Indeed, recent work by Henriksen et al., (2010) has provided detailed descriptions of successful environments in socio-culturally specific contexts, perhaps highlighting the need to develop culturally specific versions. In a similar vein, the investigation of potential sport (e.g., Black & Holt, 2009) or stage specific (e.g., Côté, 1999) requirements of the questionnaire would be valuable.

Although more work is required to establish the temporal stability of the questionnaire, it can potentially be used to help structure and/or assess the effect of interventions on the quality of talent development environments and athlete perceptions. Following on from this, while this investigation has provided insight into the ecological validity of the questionnaire through discriminant function analysis (a technique common to validation studies e.g., Raylu & Oei, 2004) more still needs to be done. Ideally, where time and resource limitations can be overcome, future research would usefully assess the criterion validity through longitudinal tracking work, in order to examine the extent to which these talent development environment guidelines were genuinely causative of positive, tangible change.

References

- Abbott, A. & Collins, D. (2002). A theoretical and empirical analysis of a 'state of the art' talent identification model. *High Ability Studies*, 13, 157-178
- Abbott, A., Button, C., Pepping, G., & Collins, D. (2005). Unnatural selection: Talent identification and development in sport. *Nonlinear Dynamics, Psychology and Life Sciences*, 9, 61-88.
- Bailey, R., Collins, D., Ford, R., Macnamara, A., Toms, M. & Pearce, G. (2009). *Participant development in sport; An academic review*. Leeds: SportsCoachUK.
- Baker, J., Côté, J., & Abernethy, B. (2003). Learning from the experts: Practice activities of expert decision makers in sport. *Research Quarterly for Exercise and Sport*, 74, 342-347.
- Bargman, R.E. (1970). Interpretation and use of a generalized discriminant function. In R.C. Bose et al. (Eds.), *Essays in probability and statistics*. Chapel Hill: University of North Carolina Press.
- Bartmus. U., Neumann. E., & De Mare'es, H. (1987). The talent problem in sports. *International Journal of Sports Medicine*, 8, 415–416.
- Bishop, D., (2008). An applied research model for the sports sciences. *Sports Medicine*, 38(3), 253-263.
- Black, D. E., & Holt, L. H. (2009). Athlete development in ski racing: Perceptions of coaches and parents. *International Journal of Sports Science & Coaching*, 4(2), 245 – 260.
- Bloom, B.S. (1985). *Developing talent in young people*. New York: Ballantine.
- Bock, R. D. (1975). *Multivariate statistical methods in behavioral research*. New York: McGraw-Hill.

- Buckley, N., & Williams, R. (2002). Response patterns and impression management. *International Test Commission Conference*, Winchester, UK.
- Button, C., MacMahon, C., & Masters, R. (2011). "Keeping it together"- Motor Control under pressure. In D.Collins, A.Button, & H.Richards (Eds.).*Psychology for physical performance*. Elsevier: Oxford.
- Chivers, W., & Darling, P. (1999). *360° feedback and organisational culture*, Institute of Personnel Department: London.
- Collins, D. (2008). Running the World-Class programme in athletics. *The Psychologist*, 21(8), 682-683.
- Côté, J. (1999). The influence of the family in the development of talent in sport. *The Sport Psychologist*, 13, 395-417.
- Côté, J., & Fraser-Thomas, J. (2007). Youth involvement in sport. In P.R.E. Crocker (Ed.), *Introduction to sport psychology: A Canadian perspective* (pp. 266-294). Toronto: Pearson Prentice Hall.
- Csikszentmihalyi, M., Whalen, S., Wong, M. & Rathunde, K. (1993). *Talented teenagers: The roots of success and failure*. New York: Cambridge.
- Douglas, C., & Martindale, R. (2008). *Player development review for PRL*. PB Performance, UK.
- Ericsson, K.A. Krampe, R.T. & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100, 363-406.
- Field, A. (2006). *Discovering statistics using SPSS*. Sage: London.
- Henriksen, K., Stambulova, N., & Rössler, K.K. (2010). Successful talent development in track and field: considering the role of environment. *Scandinavian Journal of Medicine & Science in Sports*, 20(2), 122-132.

- Gould, D., Dieffenbach, K. & Moffett, A. (2002) Psychological characteristics and their development in Olympic champions. *Journal of Applied Sport Psychology*, 14, 172-204.
- Janelle, C.M., & Hillman, C.H. (2003). Expert performance in sport: Current perspectives and critical issues. In J.L. Starkes and K.A. Ericsson (eds.) *Expert performance in sports* (pp. 19-48). USA: Human Kinetics.
- Kitson, A., Harvey, G., & McCormack, B. (1998). Enabling the implementation of evidence based practice: a conceptual framework. *Quality in Health Care*, 7, 149-158.
- Leary, M.R. (1996). *Self-Presentation: Impression management and interpersonal behaviour*. Boulder, COL: Westview Press.
- MacPhail, A., & Kirk, D. (2006). Young people's socialization into sport: Experiencing the specializing phase. *Leisure Studies*, 25, 57-74.
- Martindale, R.J.J., Collins, D., Wang, J., McNeill, M., Sonk Lee, K., Sproule, J. & Westbury T. (2010) Development of the Talent Development Environment Questionnaire (TDEQ) for Sports. *Journal of Sports Sciences*, 28(11), 1209–1221.
- Morgan, K., Kingston, K., & Sproule, J. (2005). Effects of different teaching styles on the teacher behaviours that influence motivational climate and pupils' motivation in physical education. *European Physical Education Review*, 11(3), 257-285.
- Raylu, N., & Oei, T. (2004). The Gambling Related Cognitions Scale (GRCS): development, confirmatory factor validation and psychometric properties. *Addiction*, 99(6),757-769.
- Siedentop, D. (1978). Management of practice behavior. In W.F. Staub (Ed.), *Sport psychology: An analysis of athlete behavior* .) (pp. 42-48). Ithaca, NY:Movement Publications.

Simonton, D. (1999). Talent and its development: an emergenic and epigenetic model.

Psychological Review, 106, 435-457.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Boston: Allyn

and Bacon.

Thomas, J., & Nelson, J. (1999). *Research methods in physical activity* (1st ed.):

Human Kinetics.

Table 1

Percentage Progression of Academy Players to Professional Status through Different Environments

	‘Higher Quality’		‘Lower Quality’	
Sport Two	TDE A	TDE B	TDE C	TDE D
% Conv. since 2002	50%	35.1%	26.2%	22%

Table 2

Means and Standard Deviations for ‘Higher Quality’ and ‘Lower Quality’ Environments with Resulting Effect Size, Significance Values and Canonical Variate Correlation Coefficients for Each Individual Factor

Factor	‘Higher Quality’	‘Lower Quality’	Coefficients	Effect Size	Sig
1. Long Term Development Focus	2.23 (0.44)	2.40 (0.59)	-.216	0.164	0.102
2. Quality Preparation	2.62 (0.66)	3.31 (0.81)	-.606	0.425	0.000 **
3. Communication	2.57 (0.74)	2.93 (1.11)	-.242	0.184	0.067
4. Understanding the Athlete	2.94 (0.89)	3.55 (1.02)	-.410	0.300	0.002 **
5. Support Network	3.01 (0.94)	2.95 (1.05)	.039	0.032	0.768
6. Challenging and Supportive Environment	3.11 (1.07)	3.08 (0.86)	.023	0.000	0.863
7. Long Term Development Fundamentals	2.66 (0.70)	2.93 (0.76)	-.237	0.182	0.073

Significant values $p < 0.01$ denoted **

Table 3

The Percentage Accuracy of the Questionnaire in Predicting Correct Quality Environment

Actual Group Membership	Predicted Group Membership	
	'Higher Quality' Prediction	'Lower Quality' Prediction
'Higher Quality' Group (54)	81.3% (39)	18.8% (9)
'Lower Quality' Group (62)	25.5 % (13)	74.5% (51)

Combined accuracy of group prediction - 77.8%