



Università degli Studi
di Siena

Computer and Automation Engineering

Complex Dynamic Systems – Master Seminary

TALENT IDENTIFICATION AND DEVELOPMENT IN SPORT

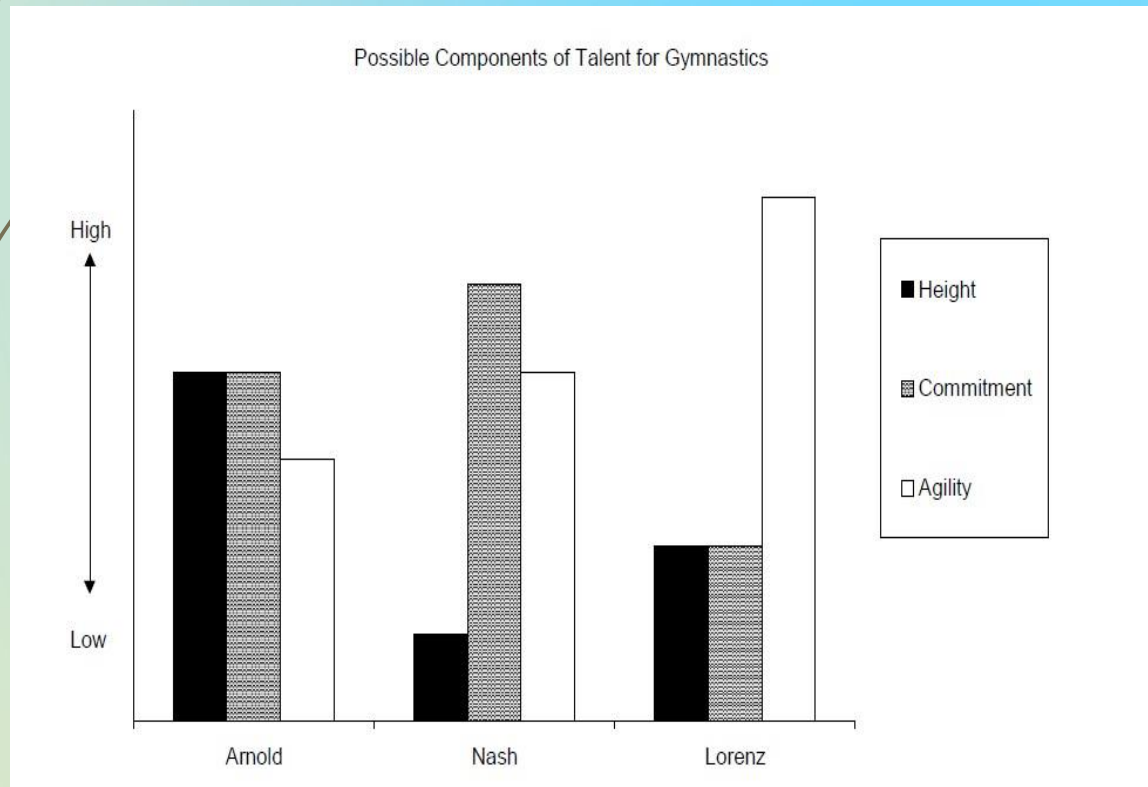
Francesco Lorenzini

WHY TO ANALYZE THIS PROBLEM?

- Talent in sport is a complex, dynamical system;
- Talent Identification (TI) has become big business to identify the best performers;
- Identifying 'talented' and eliminating 'non-talented' adolescents on unstable determinants is troubling;
- Key problem isn't in identifying the best performer at any one time but over time which factors may be limiting talent development;
- Key nonlinear dynamics concepts are related to TI approaches such as sensitivity to initial conditions, transitions, and exponential behavioural distributions.

CASE OF STUDY ON DISCRETE TIME TI MODEL

Current TI schemes typically select on the basis of discrete, unidimensional measures and physical or performance determinants, at unstable periods in the athlete's development.

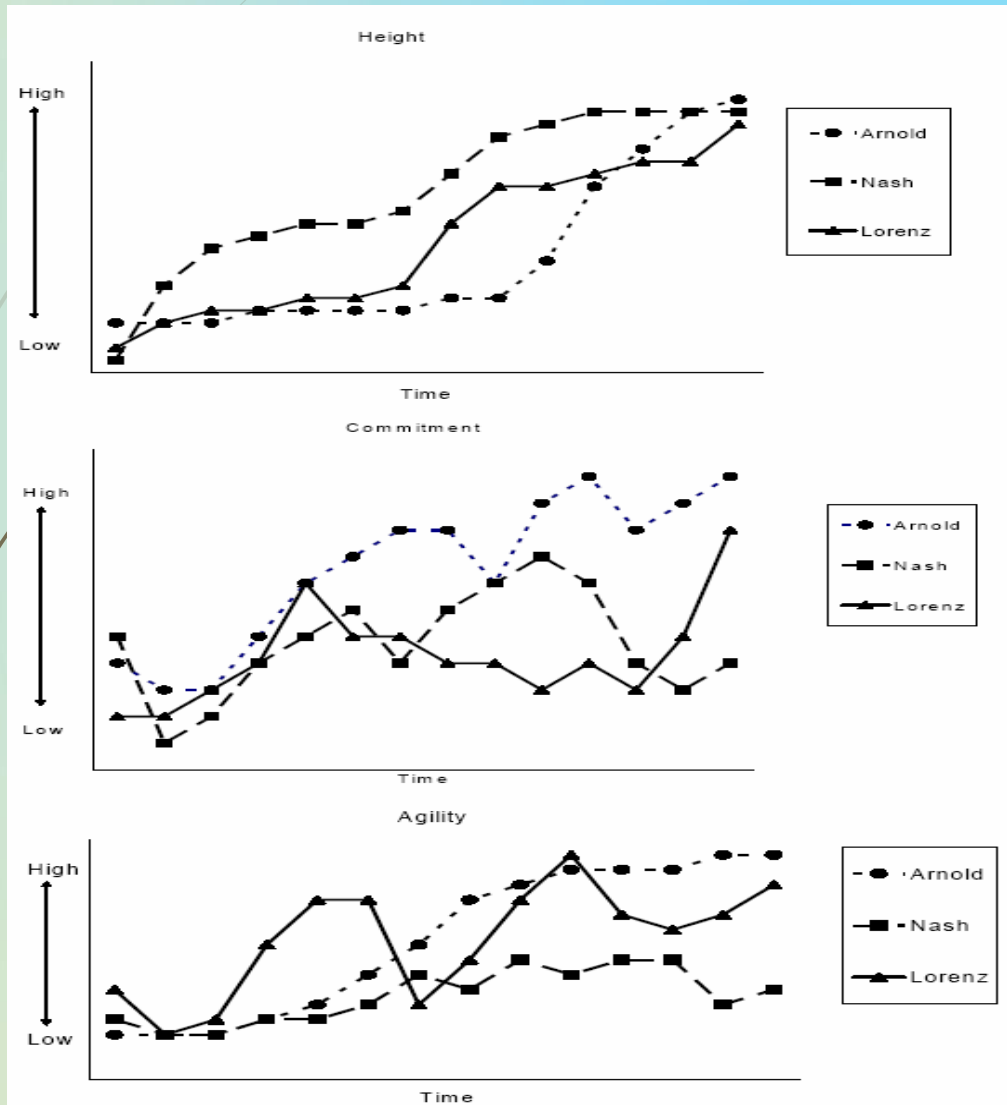


Considering data from three budding gymnasts, we have measured three components of gymnastic performance that may help to distinguish which athlete is most talented. Probably Nash would have been identified.

DRAWBACKS OF DISCRETE TIME TI MODEL

- Difficult to predict the mature value of a genetically driven variable;
- Discrete performance measures only reveal limited information about a person's adaptability and development potential;
- Ignored ability of an athlete to adapt performance to suit different situations and environments;
- Selection might be based upon unstable characteristics during important transitional periods in the athlete's career;
- Long-term predictions are only, at best, a probabilistic estimate concerning how an athlete's physique will change.

CASE OF STUDY ON CONTINUOUS TIME TI MODEL

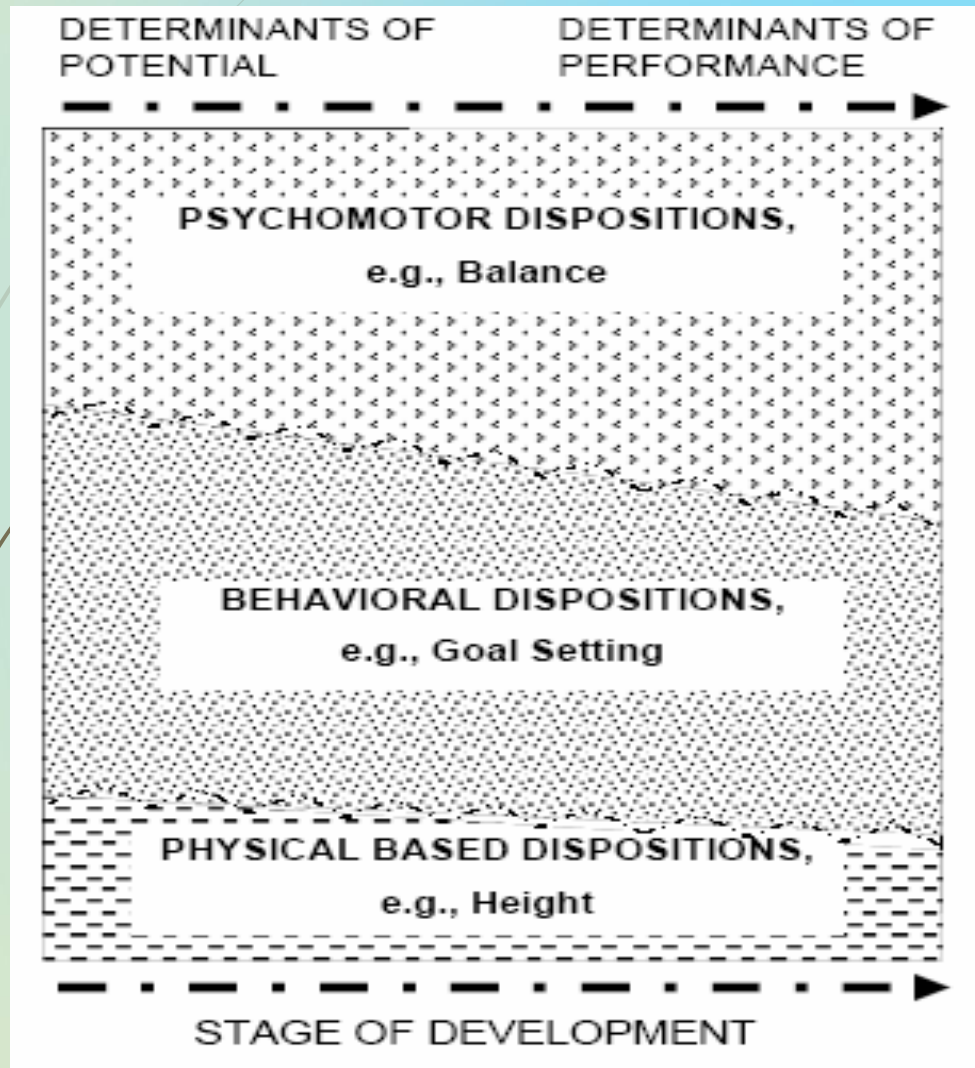


Here each factor is monitored over time. Now Arnold could be chosen as his values for height, commitment, and agility were favourable at the final re-test; alternatively, it might have been interesting to consider Lorenz, since the lack of stability in his components may indicate that he is progressing through a transitional period.

BENEFITS OF CONTINUOUS TIME TI MODEL

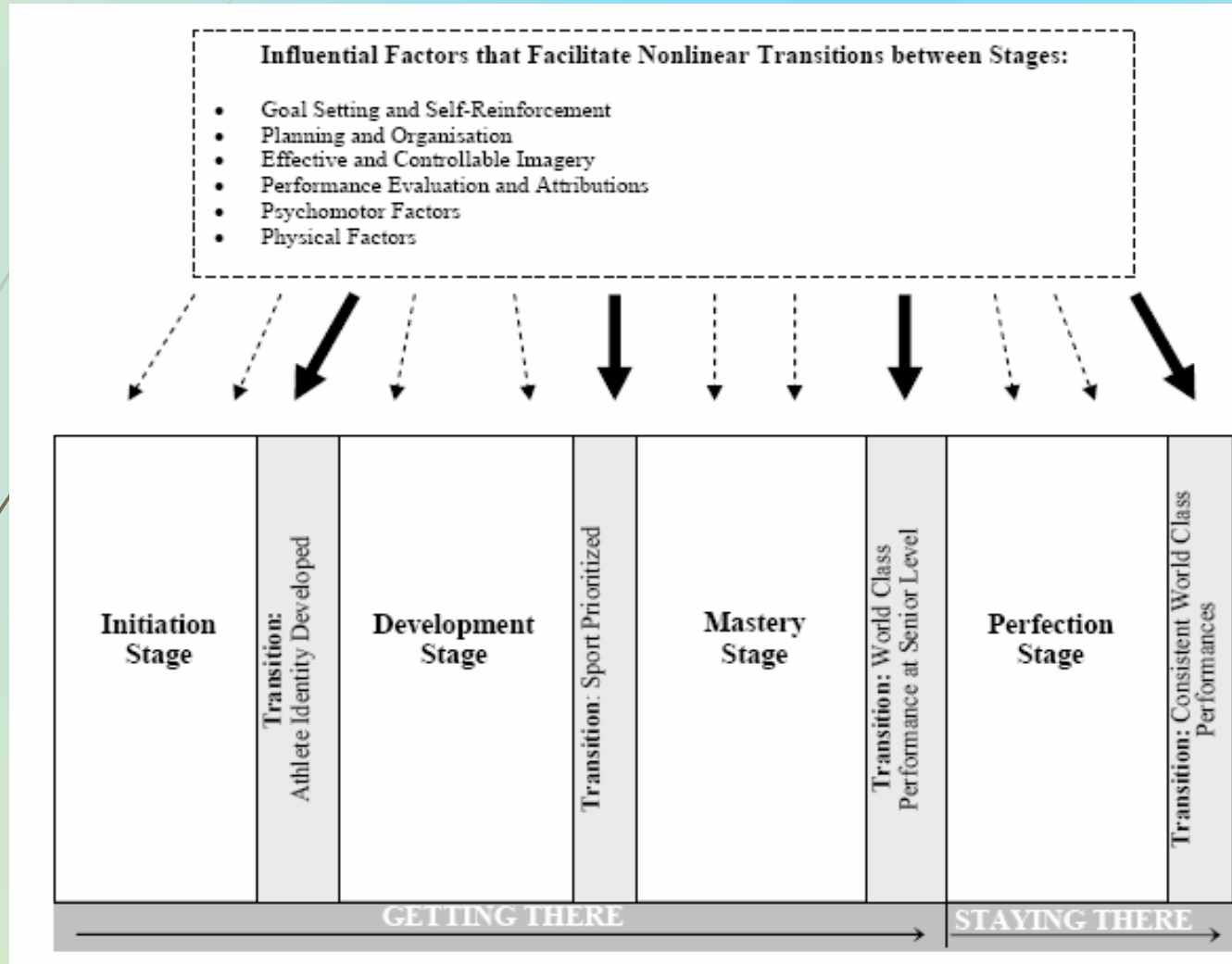
- We detect better transitions in the careers to progress to the highest standards;
- Easier to observe 'critical fluctuations', necessary to move the system from a previously stable state into a new more effective;
- Use of a dynamical systems concept, bridging, whereby the performer creates partially defined 'attractor shells' that mark future skills to be improved;
- Since we analyze more components throughout the time frame, it's possible capitalizing on individual skills or transferring them when specializing at later stages.

TI MODEL KEY FACTORS



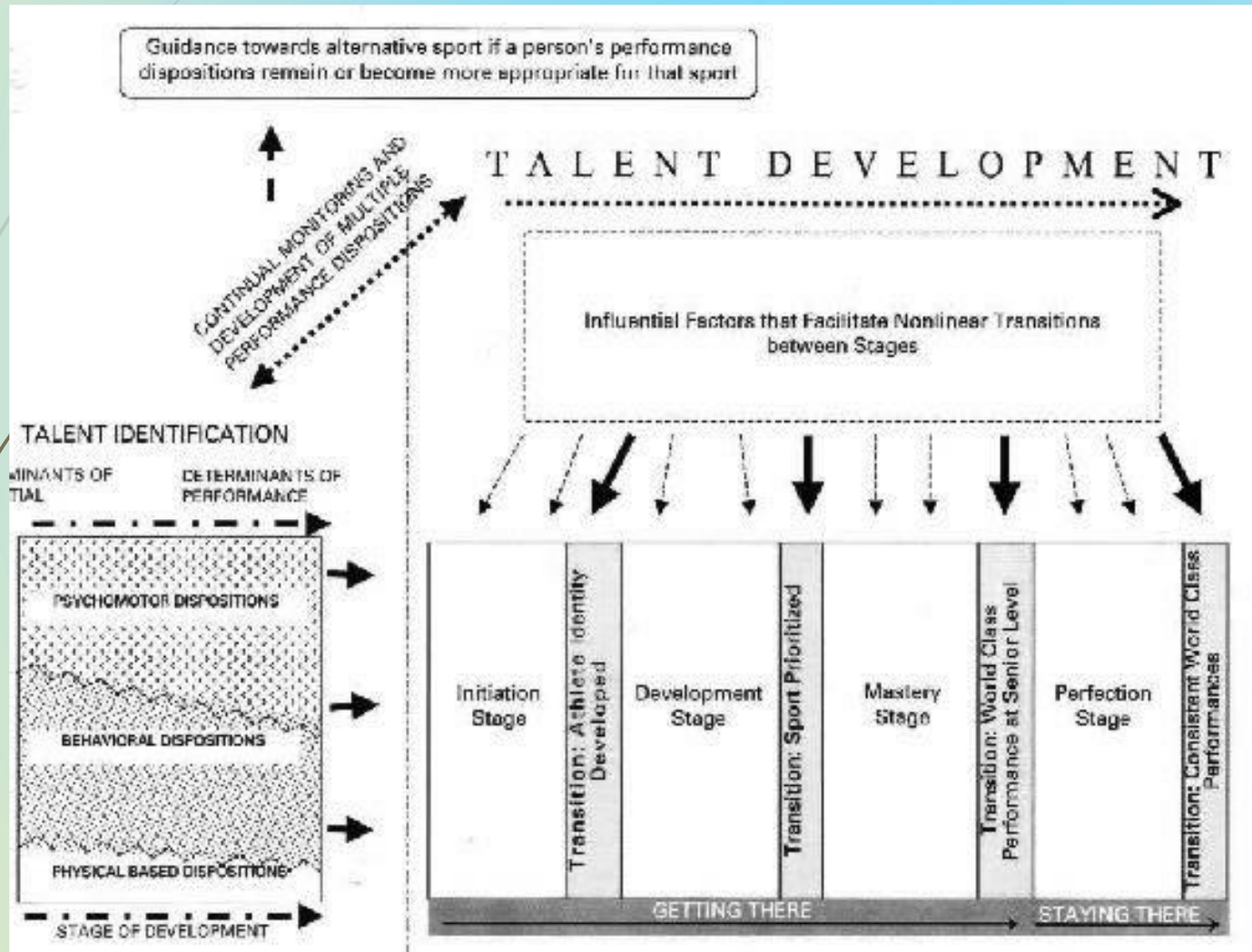
Talent Identification (TI) Model shows that key psychomotor skills and physical-behavioural attributes are advantageous and essential in order to achieve excellence. As these variables will be heavily influenced by both past experiences and physical maturity, immature values may be highly unstable and are therefore poor predictors of talent.

TD MODEL



Talent Development (TD) Model highlights four macro stages of development. Successful athlete will be able to progress through many micro and middle stages of development, making the growth highly difficult to predict.

TiD MODEL: TI AND TD INTERACTION



A multidimensional and dynamic model, that considers TI and TD as combined processes (TiD), emphasizing development and continual monitoring instead of the current practice of identification and elimination.

POTENTIAL TALENT COMPUTATION

There is a need to re-conceptualize talent as a multidimensional construct and acknowledge that many of the key performance determinants in sport can be developed with the appropriate training opportunities. So, we can calculate:

$$P_i(t) = \prod_{j=1}^k c_{ij}(t)^{W_j}$$

where $P_i(t)$ is the potential talent at time t for the i -th individual, C_{ij} is the individual's score on the component j and W_j is the weight of the j -th component.

Π indicates that each component is multiplied together to reflect the non-linear nature that a change in each variable can have on the predicted talent.

However, we need considerable development before using it for simulations.

CONCLUSIONS

Many countries are currently not selecting their most potentially talented performers due to poorly defined and theoretically weak selection tools.



SOLUTION

A generic, multidimensional model in which talent identification (TI) and talent development (TiD) processes in sport are appropriately balanced.



FUTURE DIRECTIONS

To prove the proposed TiD model we would need a significant research program with several stages, since many tunable parameters could evolve along several different potential trajectories, causing some bifurcations.



RESULT

Possibility to test the stability characteristics of an athlete's behaviour and associated dynamical concepts such as resistance to perturbation and relaxation time back into the new phase of their career.



REFERENCES

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