

Investigate Naturalistic Decision Making of Football Players to Design Virtual Environment

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ABSTRACT

Motivation – The purpose of this study was to explore and describe the thought processes of football decision-makers in natural setting. **Research approach** – Twelve French football players were observed during a specially designed study favourising counter-attacks. Players then watched a videotaped recording of their performance and provided the researcher with a verbal description of their cognitive activity during the situation. **Findings/Design** – A content analysis conducted in context identified recurrent meanings produced by the experts and revealed the use of 16 schemata. **Research limitations/Implications** – Results highlight three aspects concerning experts' decision-making processes: experts' recognition of typical situations, the flexibility of schemata in decision-making, and the evolution of the activity on the basis of contextual cues. **Originality/Value** – Modele obtained has been used for the development of the virtual environment CoPeFoot (Collective Perception Football). **Take away message** – This study provides a deeper understanding of complex football decision-making activity during dynamical situation.

Keywords

Naturalistic Decision Making, schemata, football, virtual reality.

INTRODUCTION

Our research is conducted within the context of studies of participatory simulations at the European Center for Virtual Reality. Within this perspective, we developed virtual environment for simulating play in football, in collaboration with computer scientists. The virtual environment is called CoPeFoot (Collective Perception Football). The aim of this research is twofold: 1) to define a frame of reference for orienting and structuring reflection upon decision-making processes in dynamic situations, and 2) to assist in designing a virtual environment reliant on autonomous agents. This project is part of an approach borrowed from ergonomics and cognitive psychology, and can be broken down into the following four stages: empirical analysis of the process, modeling, simulation, and evaluation.

Decision-making in sport expertise

An analysis of the literature in sports psychology showed that decision-making processes in team sports have been addressed mostly in terms of identifiable variables which have been isolated and then studied under controlled conditions. The previous studies are exclusively individual-centered, often considering the group element of the process as an afterthought. On the one hand, the decision-making processes in team sports depend on time pressures and contextual variations, and on the other, on the numerous interactions between the players. We therefore highlight the need to address decision-making in all its complexity, without neglecting the study of this concept in its social and cultural contexts. Indeed, the conceptual framework of *Naturalistic Decision Making* (NDM), usually applied to the workplace, addresses the connection between cognitive resources and contextual constraints.

Naturalistic decision-making

Research in naturalistic environments has found decision makers often rely on intuition; they just seem to know what to do without deliberation or analysis. Besides, in many situations there is not enough time or cognitive capacity for extensive deliberation before a decision is required. Intuitive decision making is the basis of Klein's Recognition

Primed Decision (RPD) model, which explains how experts quickly make complex decisions in challenging situations (Klein, 1993). The RPD model suggests that decision makers accumulate a large catalogue of patterns through extensive experience and can use these patterns to quickly categorize situations. This intuitive pattern-matching process rapidly suggests a feasible course of action. Decision makers do not need to compare multiple options and therefore, with little time and cognition, can make decisions and implement action. Studies on naturalistic decision making suggest that the experience of the practitioner is an important factor (Zsombok & Klein, 1997), particularly in determining the decision-making schemata that an expert use in a situation. Researchers generally conclude that real-world decision-making is strongly schema-driven (Klein, 1993; Lipshitz & Shaul, 1997). Our study deals with identifying the content and conditions of activation of these given background structure (i.e. schemata) by expert football players. In order to contribute to the empirical validation of this approach within the context of team sports, we put it to the test with a dynamic situation typical of team sports: a counter-attack in football.

METHOD

Twelve male expert football players (national level) between 15 and 16 years old were observed during a specially designed study. Two types of qualitative data were collected: data observed and recorded during counter-attacks situations; and data elicited during self-confrontation interviews. The self-confrontation interview is a method developed by Von Cranach and Harré (1982). It aims to elicit ongoing cognitions. The player is presented with their activity as soon as possible after the recording. Experts were asked to describe their own behaviour and activity. Interviewer questions were concerned with specific action and sought to avoid general answers. For example, a participant might be asked: 'what do you want to do here?'; 'what did you see here?' or 'what were you thinking about there?' Questions were limited to decision-making. All interviews were conducted by the lead author. The interviews were transcribed verbatim. Data analysis was conducted using a content analysis method. This qualitative process involved (a) preparing the data for analysis, (b) completing a theoretical categorization of the data, and (c) completing an empirical categorization of the data.

RESULTS

Data preparation was conducted with the aim of drawing relationships between the verbal report given by the players, behaviors observed on video, and situation development. For the present study, data analysis allowed to identify 16 schemata that guide football players' decision-making in dynamic situation. Each schema combines elements of RPD-model: goals, pertinents cues, actions, and expectancies. The data suggest that decision-making schemata are strongly influence by the role of the football player, by specific sequences of the collective action and by contextual cues.

DISCUSSION

Our research aims to study collaborative and dynamic situations through virtual environments. Decision making in these complex environments is characterized by severe time limitations, high stakes, uncertainty, unclear goals, and many organizational constraints (Cannon-bowers, Salas & Pruitt, 1996). From this perspective, and in collaboration with computers scientists, we developed the CoPeFoot simulation tool. CoPeFoot is designed for training decision-making of players, coaches or referees. Modeling obtained from the analysis of experts' decision-making processes enabled us to enrich the virtual players' digital model. Further research is needed to evaluate the impact of the NDM model obtained and implemented in the simulation.

In conclusion, this research supports the need for a contextualized and constructivist approach in explaining decision-making processes in dynamic and collaborative situations, and also models this approach for simulation purposes in virtual reality. Amongst other things, this project opens up a number of prospective avenues concerning the transfer of learning from virtual reality to real life, which should be tested by future research.

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