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Current Opinion

The Power of Two or More – Skill acquisition beyond individual learning

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ABBREVIATIONS
PDF Probability density function
UCM Uncontrolled manifold theory

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BACKGROUND: Motor skill acquisition is often studied as an individual process, despite the inherently social and interactive nature of most real-world sport environments.
VIEW OF THE PAST: Historically, skill learning occurred in communal settings, but sport research has largely overlooked social learning theories in favour of isolated, individual-based interventions.
CURRENT STATE: Emerging technologies have enabled researchers to capture real-time coordination in teams, yet few studies investigate how these dynamics develop through the learning process.
FUTURE PERSPECTIVE: To understand how people learn to move together, future research must adopt group-level analyses, longitudinal designs, and methods suited to socially embedded skill acquisition.

KEYWORDS: Motor learning | Social learning | Group dynamics | Coordination | Skill acquisition | Sport

HISTORICAL PERSPECTIVE

Social learning has long shaped human behaviour, as seen in communal rituals, martial arts, and dance [1]. Yet, research on motor learning often focuses on individuals, overlooking interactive processes in real-world settings. Rarely does one train, practice, or perform alone. At one end of the group–individual continuum, humans learn cooperative tasks with shared goals; at the other, individually performed skills typically emerge through practice alongside others in related or parallel activities.

With the development of new computational and statistical methods, and advances in information processing, recent work has aimed to quantify collective behaviour in team sport (for an overview, see [2]. These efforts have described how players co-adapt, synchronise, and regulate their actions in real time to achieve shared goals, often grounded in dynamical systems theory. However, while valuable for understanding acute behaviours during performance, these approaches rarely explore how such behaviours are learned over time. Training studies tend to use collective or integrative outcomes (e.g., group-level coordination) without examining how motor skills are acquired in group-based contexts or whether principles of individual skill acquisition transfer to social learning settings. As a result, the behavioural dynamics of sport have been increasingly explored, but the learning processes that underpin them, particularly in group settings, remain under-theorised and under-researched.

CURRENT UNDERSTANDING

Humans are inherently responsive to others in motion. It is therefore no wonder that hundreds of millions of people worldwide choose to be physically active or participate in sport as part of a group or collective. Studies on movement synchrony show that when people engage in motor skill performance together, they spontaneously coordinate their actions, even in simple tasks like walking, or rocking side-by-side [3]. In more complex tasks, such as manipulating shared tools, keeping rhythm together [4], multiplayer gaming, or Olympic 100m sprinting [5], performers develop sensitivity to others' movements and co-regulate their timing and coordination. This coordination often emerges implicitly through mutual adaptation to context. Therefore, it is reasonable to assume that in the social context of sport, the learning of motor skills by a single group member will be influenced by the presence of and interaction with others engaged in skill learning.

Bandura's Social Learning Theory [6] provides insights into how learners not only learn by doing, but by watching and adapting to others, highlighting the potent role of observation, particularly of skilled peers or teammates, in shaping behaviour. While this theory has been widely applied in education and psychology, such as in the development of peer tutoring and collaborative learning approaches [7], its application to group-based skill learning in sport remains limited. In the field of sport skill acquisition, interventions have predominantly focused on individual learning, leaving the social dimensions of skill development underexplored.

While the limited attention to sport as a social learning context is surprising, it is also understandable, as social learning in sport

presents a complex problem. Nonetheless, recent developments in sport, such as the emergence of automatic motion tracking technologies (e.g. player tracking [8], markerless motion analysis, etc.), make it increasingly possible to capture and quantify interpersonal interactions, even between individuals in relatively large groups. For example, researchers have mapped passing between 18 Australian Football League players during live matches [9] and analysed synchronisation patterns between players and subgroups in rugby contexts[10]. These technologies now enable researchers to assess co-movement, proximity, and coordination during real-world gameplay, offering a new window into the dynamics of collective behaviour in sport.

A recent scoping review by Choo and colleagues systematically examined skill acquisition interventions from randomized controlled trials targeting sports-related skills [11]. While many intervention types exist, none explicitly tested their effectiveness in social learning contexts. Moreover, no studies assessed practice effects on cooperative skills, where individuals contribute to shared goals (e.g., passing and dribbling in football). Instead, most interventions focus on isolated, repetitive, drill-based tasks, overlooking the complexities and mutual adaptations involved in group skill learning [12]. We do however have some information from non-sports studies about how individuals engage in motor skill learning within a group. For example, Wegner and Zeaman (1956), who showed that motor skill learning was enhanced in group contexts, but that the benefits didn't always transfer from solo to group performance, highlighting the importance of training in the social context in which performance occurs [12]. Their experiment found that as more individuals performed a task simultaneously, performance levels increased, but with greater variability in outcomes. This suggests that group practice may improve performance overall, but the transfer of skills from solo to group settings is not always straightforward.

FUTURE DIRECTIONS

In reality, sports-related skill learning is often socially situated. Athletes often practice in groups, even in 'individual' sports where athletes often have information from others who are practicing with (e.g. other gymnasts practicing a balance beam routine at the same time) or against them (e.g. a sparring partner in boxing). As a result, during practice, athletes often watch others succeed or struggle, take cues from peer feedback, and develop timing and rhythm in synchrony with partners. While most of this has been theorised or observed anecdotally, systematic research on how skill learning could be optimised in sport as a social learning context remains sparse, despite the potential for incremental performance gains in sport. Research from education, occupational, and team-based task environments suggests that group learning settings can accelerate or constrain outcomes depending on task structure, group composition, and the nature of interaction [13–15]. Hence, a deeper understanding how common motor skill learning interventions in individual skill learning could be applied to a group learning context would be timely.

Advancing our understanding of group learning in sport requires prioritising real-world, interactive environments, such as training sessions or repeated exposures to match play, which demand both the optimisation of modern technologies and the computational capacity to manage complex data. While these settings offer strong ecological validity, they are often difficult to manipulate experimentally, posing challenges for implementing high-level study designs like randomised controlled trials. Cooperative learning is not merely about imitation; it involves mutual adaptation over time, including negotiation, role shifts, and subtle coordination. Who adjusts to whom? Does synchrony emerge spontaneously or require guidance? How does familiarity between participants influence learning? Though these factors impact performance and perception, their role in motor learning is underexplored. Study designs that track learners across sessions will be essential in addressing these questions.

To advance the study of collective skill acquisition, researchers need to embrace both conceptual innovation and methodological flexibility. One valuable direction is the replication and adaptation of classic motor learning studies, within interactive, real-world group settings. This could help reveal how learning unfolds when performance depends on coordination with others. Future work should also explore how group dynamics, like shared goals, role distribution, familiarity, or mutual adaptation, shape learning outcomes. Optimising group training will likely require tailored practice structures that balance individual development with opportunities for coordination and negotiation. Importantly, researchers must distinguish between learning that happens in a group and learning that happens as a group. Finally, analysing group-based learning poses significant challenges, especially given that the group (not the individual) is the unit of analysis. This demands large datasets, long-term tracking, and analytical tools capable of capturing emergent, time-dependent patterns of behaviour.

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