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FITZPATRICK, Anna, DAVIDS, Keith <http://orcid.org/0000-0003-1398-6123> and STONE, Joseph <http://orcid.org/0000-0002-9861-4443>

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How do LTA mini tennis modifications shape children's match-play performance?

Anna Fitzpatrick , Keith Davids and Joseph Antony Stone

University of Sheffield Hallam, United Kingdom

ABSTRACT

Modified versions of tennis, such as Tennis Play and Stay and Mini Tennis (MT) have been implemented around the world to influence children's performance behaviours. However, it is not clear how modified versions of tennis shape match-play behaviours. We analysed 1010 match-play points, across four stages of tennis (MT Red, MT Orange, MT Green and Full Ball), to investigate effects of playing MT on children's match-play performance behaviours (Fitzpatrick, Davids & Stone, 2017). MT Red and MT Orange rallies lasted longer than Full Ball rallies, indicating that MT can afford children more opportunities to develop their skills. Also, MT players performed a higher percentage of forehands and lower percentage of backhands than Full Ball players, which may signal an unintended, imbalanced effect of practice modifications on skill development. Findings suggested that coaches should consider possible effects on match-play behaviours when designing modified practice environments for young players.

Key words: constraints-based coaching; court scaling; ball compression; mini tennis
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Corresponding author:
Anna Fitzpatrick, University of Sheffield Hallam United Kingdom.
Email:
Anna.Fitzpatrick@shu.ac.uk

INTRODUCTION

Tennis is a challenging sport for young learners, requiring a significant level of physical competence in order to generate and maintain a rally (Farrow & Reid, 2010a). To reduce children's dropout rates and facilitate skill development, tennis federations have implemented modified versions of the sport (e.g. Tennis Play and Stay and Mini Tennis). These formats aim to provide learning environments that better correspond to the current capacities of inexperienced, developing learners (Timmerman et al., 2015). For example, the Lawn Tennis Association's (LTA) Mini Tennis (MT) consists of three progressive stages: MT Red (MTR), MT Orange (MTO) and MT Green (MTG). Game characteristics such as court dimensions, ball compression and scoring format are modified at each stage, assumed to facilitate young learners' transition through MT and into Full Ball tennis (FB). However, these modified versions of tennis were introduced, based solely on the experiential knowledge and subjective opinions of coaches, and there is a need for empirical evaluations to understand how they might influence children's performance skills (Larson & Guggenheimer, 2013).

Since the inception of MT, some research has suggested that manipulating court dimensions and ball compression, individually, can enhance children's skill development (Buszard, Reid, Masters & Farrow, 2016). However, investigating manipulation effects of a single modification (e.g., ball compression) on performance limits the potential practical application of results, because several modifications are applied simultaneously within the MT framework. Furthermore, studies have typically examined children's behaviours within a practice environment, rather than examining how practising in a modified environment transfers to a match-play context. Additionally, several studies (e.g. Kachel, Buszard & Reid, 2015; Timmerman et al., 2015) have analysed performance of national-level players, rather than inexperienced young learners, for whom the modifications were originally designed. For these reasons, we examined the match-play performance of age- and playing standard-appropriate children, across four stages of tennis (MTR, MTO, MTG and FB). Our aim was to understand whether, and how, the modifications applied within the MT framework influenced children's match-play behaviours.

METHOD

Participants

Forty-eight children were recruited and stratified by their ageappropriate tennis stage (see Table 1).

Tennis Stage	n	Age (years)	Tennis-playing experience (years)	Number of points analysed
MTR	18	7.4 ± 0.6	2.1 ± 0.9	230
MTO	16	8.5 ± 0.6	3.2 ± 1.0	253
MTG	8	9.9 ± 0.4	3.8 ± 0.8	280
FB	6	13.7 ± 0.5	6.4 ± 2.5	247

Table 1. Sample sizes, age and tennis-playing experience (mean ± sd) and number of points analysed per stage.

Procedure

Performance during a total of 1010 match-play points (see Table 1) was filmed. Matches were contested on a Plexipave court surface, using new, stage-appropriate Wilson tennis balls, and adhered to MT Rules and Regulations. Video data were coded using a custom-notational analysis system, with 'very good' intra-rater reliability, k = 0.96 (O'Donoghue, 2010). Key Performance Indicators included forehands, backhands, netplay and rally length (for full list see Fitzpatrick et al., 2017). The variables in Table 2 were subsequently calculated in Microsoft Excel.

Dependent variable	Equation
Average rally length	(Rally length$_1$ + rally length$_2$ ... + rally length$_n$) / total number of rallies
Forehand %	[Number of forehands / (total forehands + total backhands + total net-play shots)] x 100
Backhand %	[Number of backhands / (total forehands + total backhands + total net-play shots)] x 100
Net-play %	[Number of net-play shots / (total forehands + total backhands + total net-play shots)] x 100

Table 2. Match-play variables.

Data Analysis

To identify inter-stage differences, data were analysed using a One-way Analysis of Variance (ANOVA) for rally length data, and a mixed design ANOVA for shot type data. Gabriel's post hoc test was used where differences were identified (Toothaker, 1993).

RESULTS

Two key findings are presented here (see Fitzpatrick et al., 2017 for all reported results).

Rally length

Findings showed that MTR rallies (7.4 shots) and MTO rallies (6.6 shots) were longer than MTG (4.3 shots) and FB rallies (3.8 shots), respectively. Figure 1 demonstrates a progressive decline in rally length throughout the stages.

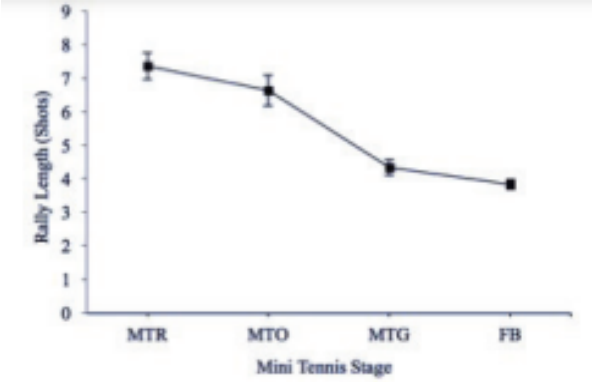

Figure 1. Mean rally length for each tennis stage.

Shot type

Results revealed differences in shot type played; more forehands were played (62.4%) than backhands (35.0%), and net-play shots (2.6%). There was also a difference in the shot type that emerged at different stages of development. Figure 2 shows that as MT stage progressed, the percentage of forehands played decreased: MTR (66.4%), MTO (65.0%), MTG (61.6%) and FB (46.0%); whereas the percentage of backhands played increased: MTR (30.9%), MTO (33.5%), MTG (37.0%) and FB (48.2%).

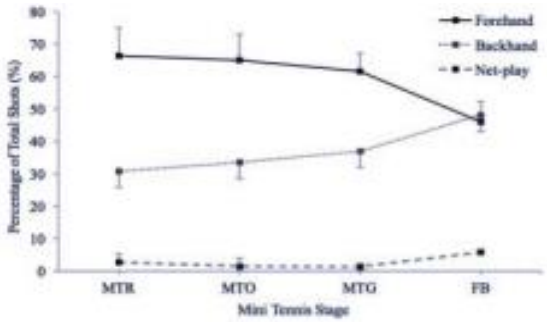

Figure 2. Shot type breakdown for each tennis stage.

DISCUSSION

Our findings showed that MT modifications did indeed influence children's match-play behaviours. When matches were played on smaller courts, using lower compression balls (i.e. MTR), an important outcome for skill acquisition was longer rallies. This finding demonstrates how task simplification can afford young learners more opportunities to perform strokes in a representative performance environment.

There was a gradual decline in rally length as the task became more difficult (i.e. as court dimensions and ball compression increased). Our findings mirror the results of previous work showing how court scaling and ball modification can increase children's rally lengths (Farrow & Reid, 2010b). Smaller courts reduce the distance a player is potentially required to move to retrieve each shot, and lower compression balls travel more slowly through the air and bounce lower, therefore adapting

the range of movement responses available to players. In this context,, MTR modifications afforded players more time to act (Martens & de Vylder, 2007) and provided a more comfortable ball-contact height, better aligned with a young child's physical stature, facilitating longer rallies; this may be more conducive to their long-term development (Kachel et al., 2015).

Inter-stage differences were also identified in the shot types that emerged. The percentage of forehands performed decreased and the percentage of backhands performed increased as court dimensions and ball compression increased. The relatively high percentage of forehands, compared to backhands, in all three modified stages, suggests that players elected to play forehands more often than backhands (a ratio of approximately 2:1 at MTR), under modified match-play conditions. This behaviour may be due to the reduced distance a player needed to move and the increased time available for him/her to move around the ball and perform a forehand. This is often the first stroke taught to children and, therefore, the favoured stroke. Moving around the ball to perform a forehand is, however, an inefficient movement (using more energy and time), with a possible detrimental effect on recovery to the centre of the court (Hughes & Moore, 1998). This outcome also implies that MT modifications do not afford children as many opportunities to perform and develop the backhand as it does the forehand. However, the reliance on forehands (evident at all three MT stages) declined until FB, where no differences were observed between the percentage of forehands and backhands performed.

Previous work has suggested the disparity between forehands and backhands may be even greater within MT coaching sessions, with Farrow and Reid (2010b) reporting a mean ratio of approximately 6:1 in favour of the forehand. This may lead to a skill imbalance over time, inhibiting a learner's development. For example, if MT modifications do not afford children sufficient opportunity to perform backhands, the stroke may not adequately develop, therefore potentially allowing weaknesses to emerge, which can be exploited by opponents during matchplay. Taylor and Hughes (1998) noted that teenage players, who move around the ball to perform a forehand when a backhand may be more appropriate, exhibited relatively high backhand error rates. The importance of developing both groundstrokes is further supported by elite-level match-play data, which demonstrates forehand-to-backhand ratios closer to 1:1 (Reid, Morgan & Whiteside, 2016).

It is important for coaches to recognise that over-reliance on one set of modifications can cause participants to become dependent on a specific skill, which may result in other skills (i.e. the backhand) not being sufficiently developed. Therefore, creativity is required in coaching practice to design different modifications which can facilitate continuous skill adaptations by players.

CONCLUSION

Our findings demonstrated how MT facilitates children's skill development. MT modifications provided young learners with more opportunities to perform strokes in a representative performance environment. The result was longer rally lengths on smaller courts when using lower compression balls. There was some disparity between the percentage of forehands and backhands performed within the three MT stages. Coaches should be aware of effects that MT modifications can have on the match-play behaviours emerging in young learners. Further research is needed to investigate whether appropriate adaptations can be applied during practice programmes, for coaches wishing to enhance opportunities for balanced stroke development in young players.

A follow-up intervention study was undertaken; results will be presented in an upcoming issue of ITF Coaching and Sport Science Review.

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