T100 or 101-250. “Fast” or “slow” achieving T100 players were determined according to the years taken to achieve a professional T100 status. International tournament and match volumes were quantified for junior and professional categories, along with tournament distribution (i.e., days between tournaments and consecutive tournaments). Three categories of junior tournaments were defined alongside four categories of professional events. A two-way (age x ranking group) analysis of variance (ANOVA) determined the effects of respective age (13-18y) and ranking group (T100 vs. T250) on competition engagement metrics.

Results: Significant interaction effects for age and ranking group were observed for all junior and professional category tournaments ($p<0.05$). Significantly higher junior tournament volumes existed for T100 compared to T250 players at ages 14 and 15 ($p<0.05$), with greater professional tournament volumes at ages 17 and 18 ($p<0.05$). Significant interaction effects for match volumes showed higher engagement from T100 compared to T250 players at ages 14-16y ($p<0.05$). Overall match counts peaked in mid-late adolescence (i.e., 16-18y) and ranged from ≈80-110 annual matches. Significant main effects for age revealed decreased days between tournaments and increased consecutive tournaments at 15y ($p<0.05$). Specifically, an average of <3 weeks existed between tournament exposures during late adolescence.

Discussion: Accordingly, increased volume and density of tournament-play exists from age 14y in future professional female tennis players. This would likely restrict opportunities for increased dedicated training loads as recommended in holistic athlete development pathways. Further, faster achieving T100 players contest higher-quality junior and professional tournaments at earlier ages. These distinctive tournament characteristics can underpin elite pathway scheduling recommendations provided by many national tennis federations. Specifically, improvements to competition pathways for elite players may exist through these understandings of “fast” and “slow” developing T100 tennis players.

Impact and Application to the Field

- Competition schedules can be used in combination with ranking milestones to inform player selection strategies and funding from national Federations.
- Focused training exposures within the athlete development matrix from tennis Federations can be explicitly provided alongside recommended tournament periodisation that is conducive to future success.

Conflict of Interest Statement: Four of the five authors are currently employed by Tennis Australia.

http://dx.doi.org/10.1016/j.jsams.2022.09.148

(P100108)

Determining stroke and movement profiles in competitive tennis match-play from wearable sensor accelerometry

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Introduction: The external load profile of tennis consists of repeated hitting and running actions, though appropriate technology to capture these concurrent demands are limited. Recent innovations in commercial wearable technology have revealed tennis-specific algorithms are able to detect forehand, backhand and serve stroke events alongside traditional movement metrics. Consequently, this study determined stroke and movement accelerometry metrics from a wearable sensor and compared between court surface (grass vs. hard) and match outcome (win vs. loss) during competitive tennis match-play.

Methods: Eight junior high-performance tennis players wore a trunk-mounted GPS, with in-built accelerometer, magnetometer and gyroscope during singles matches on hard and grass courts. Manufacturer software calculated accelerometer-derived total Player Load (tPL). A prototype algorithm classified forehands, backhands, serves and “other” strokes, thereby calculating stroke player load (sPL) from individual strokes. Movement player load (mPL) was calculated as the difference between tPL and sPL, with all metrics reported as absolute and relative ($\cdot min^{-1}$, %, $\cdot$ stroke). Analysis of accelerometer load and stroke count metrics were performed via a two-way (surface [grass vs. hard] x match outcome [win vs. loss]) ANOVA ($p < 0.05$) and effect sizes (Cohen's d).

Results: Respective mPL and sPL were reported at 431 ±185 and 116 ±55 arbitrary units (AU) during typical hard court match-play. No interaction effects for surface and match outcome existed for absolute tPL, mPL and sPL ($p>0.05$). Increased mPL% featured on grass courts compared to hard courts (83 ±2) vs. 79 ±5), while sPL% was increased on hard courts ($p=0.04$, $d=1.18$[0.31-2.02]). Elevated $sPL{\cdot}min^{-1}$ existed on hard courts ($p=0.04$, $d=1.19$[0.32-2.04]), but no differences in $tPL{\cdot}min^{-1}$ and $mPL{\cdot}min^{-1}$ were evident for surface or outcome ($p>0.05$). Relative forehand sPL (FH-$sPL{\cdot}min^{-1}$) was higher on hard courts ($p=0.03$, $d=1.18$[0.31-2.02]) alongside higher forehand counts ($p=0.01$, $d=1.29$ [0.40-2.14]).

Discussion: Hitting demands are heightened on hard courts from increased sPL and stroke counts. Conversely, increased mPL% on grass courts likely reflect the specific movement demands from point-play. In combination, these findings suggest that grouping the physical demands of hard and grass courts are likely inappropriate. Physical preparation strategies during training blocks can be tailored towards movement or hitting loads to suit competitive surfaces. Within grass court tournament blocks, detraining effects due to match-play exposures may be heightened due to lower time spent in point-play (i.e., reduced $sPL{\cdot}min^{-1}$) and could require supplementary drills from conditioning staff to mitigate this occurrence. Lastly, technical coaches can utilise stroke count measures to improve understandings of hitting load exposures across stroke type during competitive periods.

Impact and Application to the Field

- For sport science practitioners, load monitoring surveillance via accelerometry measures can be confidently implemented during training blocks given the sensitivity of sPL to court surface changes, which is reflective of different stroke types used and overall hitting volumes.
- Strength and conditioning staff working in tennis can maximise available training block time in targeting movement- or stroke-specific physical adaptations dependant on the competitive surface.

Conflict of Interest Statement: Three of the five authors are currently employed by Tennis Australia and one author is employed by Catapult Sports.

http://dx.doi.org/10.1016/j.jsams.2022.09.149

(P100109)

The use of physical function capacity measures in the management of lower limb tendinopathy: A scoping review of expert recommendations

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