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Many roads lead to Rome – Developmental paths to Olympic gold in men’s field hockey

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Abstract
This study examined the developmental sporting activities of the Olympic Champions 2012 in men’s field hockey. The volume of organised practice/training and non-organised sporting leisure play in both field hockey and other sports through childhood, adolescence and adulthood was examined and compared between the Olympic Champions and (1) current national class players and (2) international medallists of one decade earlier. Analyses revealed that the Olympic Champions performed moderate volumes of organised field hockey practice/training throughout their career and attained their first international senior medal after accumulating $4393 \pm 1389$ practice/training hours, but they engaged in extensive other sporting activities during childhood and youth. It took them $18 \pm 3$ years of involvement to attain an international medal and they had engaged for $22 \pm 3$ years when winning the Olympic gold medal. The Olympic Champions did not differ from national class players in the amount of hockey-specific practice/training, but in greater amounts of organised involvement in other sports and later specialisation. They differed from the international medallists of one decade earlier in less increase of organised hockey-specific practice/training during adulthood and a longer period of involvement until attaining their first international medal. The sporting activities were characterised by sizeable interindividual variation within each subsample. The findings are reflected against the deliberate practice and Developmental Model of Sports Participation (DMSP) frameworks and are discussed with reference to the concept of long-term sustainability.

Keywords: Elite sports, Olympic champions, deliberate practice, deliberate play, talent development, sustainability

Introduction
The type and amount of sporting activities undertaken in the course of the athletic career are a key factor in developing outstanding performance. Research consistently demonstrates that athletic excellence requires extensive organised sport-specific practice and training over many years. According to Ericsson, Krampe, and Tesch-Römer (1993), only deliberate practice (DP), designed and supervised by a coach and aiming to improve specific aspects of the athlete’s performance through frequent repetition and correction, promotes high performance. They advocated that accumulating 10,000 hours of DP over at least for 10 years is prerequisite to attain an expert level. Ericsson et al. (1993) also proposed a monotonous relationship meaning the higher the performance level, the greater the required amount of aggregated DP, and they concluded that an early start was necessary to maximise DP (p. 368, 387, 388).

On the other hand, many athletes have experienced diverse activities during childhood and youth that do not fall into the definition of DP, including sampling various sports and also non-organised sporting leisure play (deliberate play; Côté, Baker, & Abernethy, 2007). Such variable involvement is expected to provide a broad repertoire of physiological capacities (power, strength and endurance), technical and perceptual–tactical skills that can be transferred across related sports. Deliberate play may amplify variable playing experience and stimulate the exploration of varied technical and tactical solutions. It is also thought to maximise joy and support the foundation of the motivational “starting capital” for later extensive investment in one domain sport (Côté et al., 2007).

Athletes’ participation histories were structured in pathway models based on the occurrence, composition and amounts of four analytical types of activities through different age periods. These include activities undertaken in the respective domain sport vs.
those undertaken in other sports and organised practice/training vs. deliberate play. Côté et al. (2007) contrasted two distinct pathway models in their Developmental Model of Sports Participation (DMSP): the early specialisation pathway is characterised as early concentration in one sport with reinforced sport-specific DP/training that is subsequently expanded through all age periods. Alternatively, the diversification pathway is characterised by progression through three stages (“sampling” 6–12, “specialising” 13–15 and “investment” 16+ years) from initial involvement in multiple sports, little DP and large amounts of deliberate play towards eventually focusing on one main sport, large amounts of sport-specific DP and little deliberate play.

**Problem and state of research**

Both DP theory and DMSP build on (time) volumes of defined activities. Exploring whether these frameworks’ scope extends to contributing to the explanation of success differences within elite sport implies the comparison of the amounts of the activities between more and less successful high performers.

The relatively fuzzy definitions of the pathways impede their direct empirical testing. Rather, the empirical approach is to document indicators of well-defined activity types, compare more and less successful athletes and subsequently reflect their correspondence to the DMSP and DP framework. Researchers have usually used elite athletes’ retrospective recall to study their participation histories. Despite extensive research through the last ∼25 years, there is still considerable inconsistency in the state of empirical investigation. Each of the described types of sporting activities correlated positively with performance or success in some studies but not in others (see Güllich & Emrich, 2014, for a review). This may accrue from various reasons, e.g.:

- Equal activities may lead to different performance progress interindividually, and different individual variants of developmental activities can lead to identical success. Furthermore, the use of the time within defined activity types may vary (Deakin & Cobley, 2003; Ford, Yates, & Williams, 2010).
- The absolute volume of practice/training and its significance to success may vary across cohorts in historical chronology and between different sport systems, sports, ages and success ranges.
  - For example, Ericsson (2006) interpreted the parallel increase of sporting performance and practice/training volume through the last century as a foundational argument for DP. Over recent decades, competitions have expanded together with growing commercialisation, and elite athletes extended the training time (Fiskerstrand & Seiler, 2004; Heinila, 1982). The latter trend appeared, however, to level off in German athletes in the 1980s (male) or 1990s (female; Güllich, Pitsch, Papathanassiou, & Emrich, 2000). Respective studies involving current international top athletes are lacking, though.
  - Training volumes may differ between different sport systems (e.g. Ford et al., 2012; Güllich & Emrich, 2013) and types of sports. For example, top athletes in artistic composition and endurance sports (e.g. Deakin & Cobley, 2003; Law, Côté, & Ericsson, 2008; Seiler & Tonnessen, 2009) usually tend to perform more practice/training than those in team game sports (Baker, Cote, & Abernethy, 2003; Memmert, Baker, & Bertsch, 2010; Van Rossum, 2000).
  - Based on a review of 19 studies and their own investigations, Güllich and Emrich (2014) revealed that – consistent across different types of sports – the relationship between performed sporting activities and success may depend on athletes’ age ranges and success levels. Early specialisation and reinforced sport-specific practice/training favoured rapid juvenile success, but not long-term senior success. Accumulated specific practice/training differentiated senior athletes across moderate and/or relatively heterogeneous success ranges, but not senior national and world class (corresponding to the observation that the variance of practice/training typically tends to decrease with narrowed success ranges; Ackerman, 2013). However, world class mostly exhibited more variable involvements in diverse sports and later specialisation. That is, conditions for international senior success cannot be concluded by simply extrapolating the scope of findings from athletes with moderate success level or from junior athletes. Investigations on the most accomplished performers are relatively scarce, though, and there is clearly a need for more detailed research on the careers of world class athletes.

This study exemplifies the examination of the developmental sporting activities in the world leading men’s field hockey team, Team Germany.

Field hockey is organised in 127 national associations worldwide. Within Germany, it neither belongs to the most nor the least popular sports. Currently, ∼70,000 members are organised in field hockey clubs, which is less than for example that in athletics, football, handball or swimming, and more than that
in cycling, figure skating, ice hockey, rowing, squash or wrestling.

The following questions are investigated:

- In which types of sporting activities did the present Olympic Champions engage how extensively in the course of their career?
- Which commonalities and differences do they exhibit compared (1) to current peers at a national success level and (2) to players who had attained international medals one decade earlier?

The respective results allow for subsequent analysis whether the players’ patterns of involvement correspond to the tenets of DMSP and DP theory.

Methods

The participants responded to a standardised questionnaire administered by mail (2002; Güllich & Emrich, 2006, 2014) or personally (2012). Potential participants were instructed that their response was voluntary, all responses would remain anonymous and the use of the data was exclusively for scientific purposes. This study received ethical approval from the German Federal Institute of Sport Science.

Participants

The complete male Olympic Champion team (labelled OCh2012 from here on; n = 16; age 26.6 ± 3.1 years; mean ± standard deviation) participated in this survey. We wanted to compare them with peers who were also experienced high-performance players but had not achieved international success: 19 athletes who played in four first division teams (“Bundesliga”) but who had not attained international senior medals participated (national class, NCl2012; age 22.3 ± 3.6 years). In addition, inclusion of 19 players who were involved in the survey in 2002 and who had won medals at Olympic Games, World and European championships (world class, WCl2002; age 24.2 ± 2.6 years in 2002) enabled analysis in trend design.

Some 15 OCh2012 were serial gold medallists, i.e. each had already won gold medals at Olympic Games, World or European championships before 2012; the 16th player was a serial medallist. Among WCl2002, 13 were serial international medallists.

In respect of the comparison between OCh2012 and NCl2012, it is important to note that the Olympic Champions had attained their first international senior medal at age 22.0 ± 2.6 years while none of NCl2012 had won an international medal by their current age of 22.3 ± 3.6 years.

Measurement of career “milestones” and sporting activities

The questionnaire of 2002 was supplemented by questions addressing field hockey leisure play. While we addressed variable engagement in diverse sports already in that study, non-organised play in the athlete’s main sport was not (yet) a subject in the international literature at that time and was, therefore, not recorded in 2002.

Since different types of activities have been assigned different potential effects in the literature, these were recorded separately. The respondents reported the following variables:

- Age for start of organised practice/training in a field hockey club, first recruitment into the federation’s squad (selection is based on coaches’ scouting at junior tournaments from minimum 11 years), first medal at national level, first international senior medal.
- Frequency and duration of organised practice/training sessions in their field hockey clubs within the age categories of ≤10, 11–14, 15–18, 19–21 and 22–25 years (corresponding to the competition age categories).
- Involvement in organised practice/training in a sport club in other sports; non-organised sporting leisure play outside organised in-club sessions in field hockey and in other sports; in each case age periods of involvement and frequency of the type of activity within each age category, respectively.

Test-retest–reliability was tested earlier over three years (0.80 < rtt < 1.00; Güllich & Emrich, 2014). In addition, an identical football version of the current complemented questionnaire was examined in a parallel study involving 38 young football players (16–23 years) over three weeks (0.91 < rtt < 1.00).

Statistical analysis

Analysis was performed using SPSS 20.0. Descriptive data include frequencies, mean value, standard deviation and “Pearson’s r”. The estimates of the volumes of activities are reported as annually accumulated time (organised field hockey) or frequency (all activity types) by multiplying the mean weekly time or frequency by the annual weeks of involvement. This factor should take account of longer vacations and off season of organised in-club practice/training at younger ages and was set at 40 weeks until 14 years, 45 at 15–18, 48 at 19–21 and 50 weeks at 22+ years.
Group differences were analysed using chi-square and unpaired $t$ test. A non-parametric $U$ test was conducted for non-uniform (skewed) data distribution. Effect sizes are expressed as Cohen’s $d$ using pooled variance for differences in group means. All statistical hypothesis testing was two-tailed. A value of $p < 0.05$ was considered statistically significant.

**Results**

**Description of the Olympic Champions’ participation history**

As shown in Table I, only four OCh2012 engaged exclusively in organised field hockey while the other players experienced one ($n = 1$), two ($n = 3$) or three ($n = 8$) types of other activities. Non-organised field hockey took place exclusively on the clubs’ pitches before or after the regular sessions. Most other practiced sports were game sports. Organised involvement in other sports mostly included participation in competitions.

The age structure of the career is described in Table II. Most players began involvement in childhood sports in general as well as hockey-specific activities, both organised and non-organised, during early childhood. They continued organised practice/training in various sports as well as leisure play in any sport for $\sim$10 years and in field hockey for roughly 8 years and specialised exclusively in field hockey after more than 10 years of involvement. The Olympic Champions engaged in sport-specific practice/training as long as $\sim$12 years before attaining their first medal at a national level and $\sim$18 years before attaining their first international senior medal.

The absolute volume of organised field hockey practice/training was moderate throughout the career; it increased continuously from 95 ± 36 hours $\times$ year$^{-1}$ until 10 years to 500 ± 199 hours $\times$ year$^{-1}$ in adulthood (Figure 1). The Olympic Champions accumulated 2183 ± 1388 hours of organised sport-specific practice/training before attaining their first medal at a national level and 4393 ± 1389 hours before attaining their first medal at international senior championships. All other activities decreased gradually from childhood through adolescence and adulthood. Interestingly, the players participated more frequently in other types of sporting activities than in organised field hockey until age 10 (151 ± 128 vs. 79 ± 27 times $\times$ year$^{-1}$) and 11–14 years (162 ± 164 vs. 99 ± 23 times $\times$ year$^{-1}$).

**Comparison of OCh2012 with NCl2012 and WCl2002**

The types of activities and sports the players engaged in were widely consistent between the subsamples (Table I). Also, OCh2012 did not differ significantly from NCl2012 or WCl2002 in the total volume of organised field hockey practice/training performed before attaining a medal at a national level (NCl2012: 2730 ± 888; WCl2002: 2085 ± 723 hours) or at international senior championships (WCl2002: 5118 ± 1629 hours).

OCh2012 differed from NCl2012 in having started involvement in organised practice/training in other sports earlier, they engaged in various sports

### Table I. Frequency of players engaging in defined types of sporting activities and sports for one year or longer

<table>
<thead>
<tr>
<th></th>
<th>Olympic Champions 2012 ($n = 16$)</th>
<th>National class 2012 ($n = 19$)</th>
<th>World class 2002 ($n = 19$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organised field hockey and...</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Field hockey non-organised leisure play</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Other sports organised</td>
<td>12</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Of these: other sports competitions</td>
<td>10</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Other sports non-organised leisure play</td>
<td>9</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td><strong>Experienced other sports</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Games</td>
<td>12</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Invasion games</td>
<td>9 [basketball (4), football (7), ice hockey]</td>
<td>9 [football (7), handball (2)]</td>
<td>8 [basketball, football (8), rugby]</td>
</tr>
<tr>
<td>Racket, stick, club games</td>
<td>11 [golf, ice hockey, squash, tennis (11)]</td>
<td>10 [badminton, golf (5), squash (2), table tennis (2), tennis (9)]</td>
<td>14 [golf (3), table tennis (2), tennis (12)]</td>
</tr>
<tr>
<td>Other games</td>
<td>0</td>
<td>1 [bowling]</td>
<td>1 [volleyball]</td>
</tr>
<tr>
<td>Non-games</td>
<td>2 [Olympic gymnastics, skiing, swimming]</td>
<td>3 [cycling, skateboard, skiing/snowboard (3), sailing/surfing/wakeboard (2)]</td>
<td>10 [athletics (2), ballroom, equestrian, judo, Olympic gymnastics (3), skiing (2), swimming]</td>
</tr>
</tbody>
</table>

*Non-organised field hockey leisure play not recorded in 2002.*
over longer periods, specialised later in field hockey and were also recruited later into the federation’s squad (Table II). There was a slight but significant difference in organised hockey practice/training at 11–14 years (Figure 1). OCh2012’s greater amount of organised practice/training accumulated in other sports until 14 years narrowly missed statistical significance.

It is important to note that the activities’ volumes varied sizeably within either success group, respectively. The volume of field hockey practice/training accumulated until 21 years ranged from 2578 to 6472 hours within OCh2012 ($V = 31.9\%$) and 2824 to 5768 within NCI2012 ($V = 19.6\%$); in non-organised field hockey, the range of the frequency was 0–1760 ($V = 96.1\%$) and 0–2688 ($V = 121.0\%$), and in other sports 0–3900 ($V = 107.2\%$) and 0–1680 ($V = 103.2\%$).

The Olympic Champions differed from WCI2002 with longer involvement in hockey practice/training before attaining their first international senior medal (Table II) and later entry in the federation’s squad. Their volume of organised sport-specific practice/training until 18 years and their involvement in other sports at any age was comparable (Figure 1), but OCh2012 increased organised field hockey sessions and time modestly during adulthood compared to WCI2002.

**Discussion**

The central findings of this study are that the Olympic Champions started sports involvement during early childhood, performed moderate amounts of organised sport-specific practice/training throughout their career, participated extensively in other sporting activities, specialised relatively late and engaged over very long periods before eventually attaining international senior medals. Their developmental participation pattern was all in all similar to the other subsamples. They only differed from national class in more extensive organised participation in various sports and later specialisation, but not in more organised field hockey practice/training or non-organised sporting play at any age. Sport-specific practice/training volumes were unchanged compared to one decade earlier through childhood and adolescence, but lower within adulthood.

From an empirical perspective, the Olympic Champions’ absolute volume of field hockey practice/training is in the range of reports from other Australian, German and Dutch world class hockey
players (Baker et al., 2003; Memmert et al., 2010; Van Rossum, 2000), while it is below that reported from the Belgian (non-world-class) players studied by Helsen, Starkes, and Hodges (1998). It is also consistent with the observation that elite players in team game sports typically perform less practice/training than those in some other types of (individual) sports (see introduction), but engage extensively in various sports and in sporting leisure play (Baker et al., 2003; Berry, Abernethy, & Côté, 2008; Güllich & Emrich, 2014; Memmert et al., 2010; exception football youth academies: e.g. Ford et al., 2012; Ward, Hodges, Williams, & Starkes, 2004). Such sport-specific differences are presumably attributable to different restrictions of an optimal practice/training (time) volume due to different loading characteristics (mechanical, physiological, psychological stress, proportions of ballistic/eccentric loading, technical/tactical entrainment, “time on task” within sessions – e.g. Olympic gymnastics vs. cycling – and frequency of competitions). In this context, invasion games are typified by integrating very complex demands (speed, agility, strength, power, endurance, technical, tactical exercise,
tacklings, relatively long “time on task” within sessions and frequent matches), whereas the synthetic turf and the frequent bent-over posture are additional particularities of field hockey.

Regarding the significance of participation patterns to success differences, this sample was selective in that it involved only experienced senior high performers. It may be that practice/training volumes differentiate success at lower ages and lower or wider success ranges (Ackerman, 2013). With a view to the highest success ranges, a difficulty is that comparative studies are scarce – more so research comparing success-differentiating developmental activities across different sports. The (to our knowledge) only respective study involved world class and national class athletes from all Olympic sports (Güllich & Emrich, 2014). It showed significant differences in absolute practice/training amounts between different types of sports, but no respective interaction of success and type of sport. The present results from Olympic Champions and national class are consistent with that study and some other investigations involving comparable success ranges in game sports and other sports (Carlson, 1988; Johnson, 2006; Ronbeck, Dunnagan, & Stewart, 2005; Van Rossum, 2000) in that world class did not accumulate more sport-specific practice/training but engaged more extensively in various sports.

Also, the lacking difference in the amount of sporting leisure play corresponds to the observations of Baker et al. (2003), Memmert et al. (2010) and Weissensteiner, Abernethy, Farrow, and Müller (2008).

In conclusion, the findings’ scope applies, for the time being, to current German top field hockey players. The absolute practice/training volumes are hardly transferable to a number of other sports, success-differentiating activities across lower or wider success ranges are uncertain and while some studies revealed consistent findings within top athletes, these are rather few. Clearly, further research addressing commonalities and differences between different sports in sporting activities leading to outstanding success is needed.

From a conceptual perspective, each of the sub-samples exhibited some correspondence with as well as deviation from either pathway model in DMSP at a descriptive level. In addition, only organised participation in various sports differed between the success groups, while all other activities constituting the pathway models exhibited no success-differentiating effect in this sample. Also, the composition and volumes of the sporting activities changed across different age ranges, but the Olympic Champions maintained involvement in various sports much longer than predicted by DMSP. Furthermore, the activity data display a continuous gradual increase of organised field hockey and decrease of other activities through adolescence and adulthood rather than identifiable “transition points” between stages. We hypothesise that the club-based organisation of competitive sports in Germany is – unlike that of Anglo-American countries – more independent from scholar transitions (e.g. primary, junior, senior high school).

In regard to the notion of DP, not only did specific practice/training quantities not differentiate success, but also the volume of practice/training required to become an international senior medallist was far below the 10,000 hours predicted by Ericsson et al. The type of activity interpreted in the literature as – in parts – corresponding to the original definition of DP is organised sport-specific practice/training. This made ~4400 hours in the Olympic Champions. Abernethy, Farrow, and Berry (2003) suggested to summate all types of sport-specific activities including competitions and deliberate play. Assuming a player’s team had passed all rounds in all tournaments and he had played through all matches throughout his career (which is, however, very unlikely), these would result in ~900 hours. Assuming one hour for each time of deliberate play, this would accumulate to ~720 hours. All field hockey activities would then sum up to ~6020 hours. Even adding ~1800 hours of participation in other sports (assuming 1.2–1.5 hours in-club sessions across the age categories, data from all Olympic sports, Güllich & Emrich, 2014), the Olympic Champions accumulated ~7800 hours subsuming all sporting activities; thereof ~44% clearly being outside the original definition of DP.

In addition, the sizeable interindividual variation of sporting activities within the Olympic Champions highlights the acquisition of sporting excellence as a profoundly individual process.

- In light of the complex performance structure, different “profiles” of athletic qualities acquired through different compositions of activity types may be successful.
- Involvement in various sports not only facilitates subsequent learning and refinement of specific skills but also most notably raises the chance to elect the individual sport of “best fit” based on variable experience (multiple sampling and functional matching). Players participating exclusively in field hockey were, hence, either talented for various sports including field hockey or they “hit” hockey as their sport of “best fit” straight away by chance.
- Very unequal variants of practice/training processes must have been very effective. This includes that each player must have managed efficiently to promote performance progress.
over many years while continuously balancing strain with recovery based on his individual stress-tolerance and also balancing the time consumption in sports with demands and interests outside of sports (education, family, friends, hobbies, etc.). Assuming that responsiveness to practice/training, stress-tolerability and available time for training vary in parts independently from one another from one another implies that the Olympic Champions included players with high responsiveness, stress-tolerability and much time for training as well as players with less stress-tolerability and/or time for training but even higher responsiveness to practice/training.

It is, thus, not surprising that the sporting activities varied considerably within this extremely success-homogeneous sample and that all combinations of more or less organised specific practice/training, diversification and sporting leisure play were existent within each success-group (pointing to the limitation of group comparisons in a field of profound individuality).

With the above said, the present observations’ value is foremost idiosyncratic in that they highlight that (1) moderate intensity of specific practice/training maintained over very long periods may be one of the paths to international success and (2) developmental activities leading to excellence vary not only between different sports but also within a sport, i.e., “Many roads lead to Rome”.

In conclusion, most Olympic Champions exhibited – at best – partial correspondence to either of the DMSP pathway models and the DP framework, and more or less close correspondence to either model provides little explanatory power to explain individual success differences among the German top players.

At the individual level, it is unknown a priori when which composition of which amounts of which types of activities is (prospectively) most beneficial to which individual athlete. Presumably, the Olympic Champions’ investment pattern raised the probability of successful careers by facilitating long-term sustainability (Güllich & Emrich, 2014). Variable distribution of the “risk capital” (various sports over long time) and only moderately intense domain-specific investment “stretched” over long periods is obviously a rather cost-reducing and risk-buffering investment pattern that went along with long delay of reward (late participation in federation’s squad, late international medal), but presumably benefited long-term sustainability – consistent with the fact that these players had engaged in field hockey as long as 21.6 ± 3.2 years into career before winning the Olympic gold medal.

Maybe the Olympic Champions’ relatively modest intensification of practice/training in adulthood may also be reflected under this perspective. While there may be a variety of conceivable reasons including changes in the player profile demanded or the training “philosophy”, differences in the players’ educational/occupational demands, etc., their discussion would remain speculative due to lacking reliable empirical foundation. An evident aspect is that the German Field Hockey Federation has increased the number of international friendly matches and the Euro Hockey League was launched in 2007. These imply ~25% increase in international match play, presumably including warm-up and cool-down activities and increased set-up and passage time and leading to more profound psychophysical fatigue than practice/training. Supposing that the players pursue over multiple years to come close to the margin of their individual stress-tolerability without exceeding it, their relatively modest intensification of practice/training may be a reaction to expanded international tournaments.

Methodological considerations and outlook

Beyond the aspects discussed above relative to the findings’ scope, two further limitations inherent to the subject require consideration in this study:

- The selected sample’s strength – its outstanding and reproduced success level – implicates its weakness of a small sample size and little statistical power. Also, the effect sizes of some group differences were only moderate.
- Involving current top athletes implies that potential recent changes in current conditions for future success cannot be captured.

Future research should seek to examine different individual configurations of sporting activities leading to excellence in more detail. Longitudinal quasi-experimental cohort designs may go beyond the “macrostructure” of activity types and record their “microstructure” more “fine-grained” while complementing quantitative measures by qualitative attributes of practice. Furthermore, the interaction with varying demands as well as support from the social environment merits consideration.

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