Self-regulated Learning Differences Between Endurance and Non-endurance Sports Among Elite and Sub-elite Youth Athletes

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Abstract

This study investigated self-regulated learning (SRL) differences between endurance and non-endurance sports youth athletes, who performed at elite or sub-elite levels. A relative performance comparison approach was explored to determine youth athletes' performance level. The sample comprised 104 participants aged between 12 and 18 years old (M = 14.86; SD = 1.50) and included 47 females and 57 males. The data was gathered in 2019 and 2021 at the Topsport Talentschool of Groningen, a school establishment recruiting top-performing athletes. A MANCOVA was conducted with the six SRL subprocesses as dependent variables, sport type and performance level as independent variables, and age and gender as covariates. The yielded results showed no significant main effect of sport type on reported SRL skills use, and no significant main effect of performance level on the application of SRL processes. No significant interaction effect was found either on youth athletes' self-regulatory processes. Based on these findings, it was therefore concluded that the youth athletes who participated in this study did not differ in their application of SRL processes, despite engaging in varying sport types and performing at different levels. These results were potentially influenced by the homogeneity of the sample. The gathered findings were further discussed in relation to previous research on endurance performance and sport eliteness. In sum, this study contributed additional insights to the fields of endurance performance and athletic eliteness.

Introduction

The field of sport and performance psychology received increasingly more attention over the past decades (Gahwiler et al., 2019). Several aspects of athletes' development need to be considered in order to optimize their growth and hopefully reach top elite performance in their discipline (He & Dong, 2018). In this regard, mental skills and processes are an integral part of athletes' trainings and competitive performance, among which self-regulation plays an essential role (Zakrajsek & Blanton, 2017). Self-regulatory processes received great support for their ability to promote goal-directed behavior and improve athletes' performance in their sport (Balk & Englert, 2020; Zakrajsek & Blanton, 2017). Current literature counts numerous studies examining self-regulatory mechanisms, characteristics, and practical implications within the sports domain, some of which will be presently discussed.

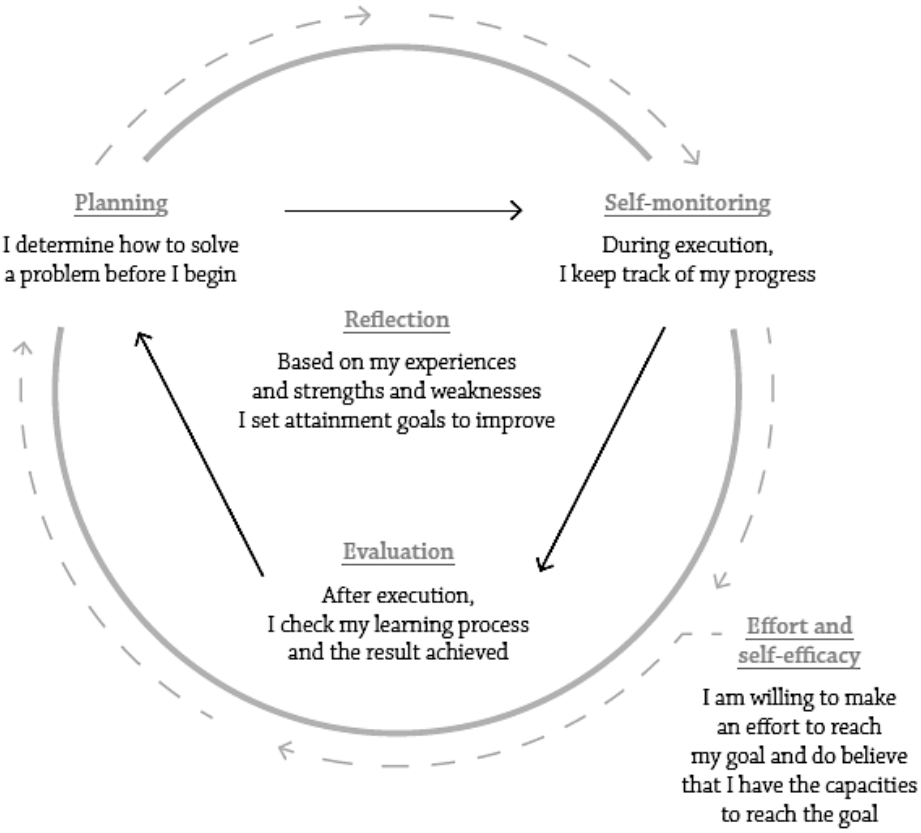
Self-regulation can be defined as the process where an athlete generates thoughts, feelings, and behaviors that are directed towards their personal goals' achievement, resulting in better performance (McCormick et al., 2019; Zimmerman, 2002). However, self-regulation can also be applied in a learning and developmental context, where individuals proactively control their learning behavior in order to transform their mental capacities into certain performance skills (Zimmerman, 2008). This process is specifically referred to as self-regulated learning (SRL). Furthermore, SRL is seemingly related to the learners' motivational beliefs, metacognitive skills, adaptive abilities, and their overall perseverance in their learning process (Zimmerman, 2008). The mechanisms underlying SRL will be described in more detail in subsequent paragraphs.

At the core of SRL, metacognitive skills relate to the learner's capability to reflect upon their own thinking processes and emotional states (Jonker et al., 2015). As discussed by Jonker and colleagues (2015), the metacognitive skills comprised in SRL are planning (i.e., the ability to become aware of a future task's demands prior to its execution), reflection (i.e.,

the capability to think about one's past experience, based on which skills are improved and future strategies are adapted), evaluation (i.e., the capacity to assess both the processes leading to, and outcomes after task completion), and self-monitoring (i.e., the capability to estimate one's performance during task completion). Additionally, these metacognitive processes have a cyclical relationship, as depicted in Figure 1 (Jonker, 2011). Thus, SRL benefits individuals in their skill acquisition through the successful execution of these metacognitive skills and strategies (Zimmerman, 2008).

Figure 1

The Self-regulated Learning Cycle and Processes



In addition to the aforementioned, motivational beliefs also play an important role in SRL. Specifically, they refer to the individual's intrinsic motivation to actively participate in their learning trajectory, their self-efficacious beliefs for this process, and their autonomy throughout the learning trajectory (Jonker et al., 2015). The main components are self-

efficacy (i.e., the judgment of one's own capability to successfully execute action steps in order to cope with, and meet the task's demands; Jonker et al., 2015; Toering et al., 2012) and effort (i.e., one's readiness to invest themselves into their goal's achievement; Jonker et al., 2015). These motivational beliefs are also depicted in Figure 1 (Jonker, 2011). Altogether, individuals can benefit from applying SRL metacognitive skills and motivational beliefs, as this would enhance their learning efficiency (Jonker et al., 2015). It should finally be noted that SRL processes can be employed across different learning domains, although the present study focuses on the field of sports.

Current research demonstrates consistently the benefits of SRL for sport performance. For instance, recent findings highlight that expert (i.e., higher performing) athletes tend to display better developed self-regulatory skills in comparison to non-expert (i.e., lower performing) athletes (Balk & Englert, 2020). Further supporting this reasoning, junior athletes competing at an international level were found to demarcate themselves based on their superior reflective skills, in comparison to junior athletes competing at a national (i.e., lower) level (Jonker et al., 2010). Similarly, other research findings pointed out that junior elite athletes exhibit more effort compared to junior sub-elite athletes (Jonker et al., 2015). Henceforth, SRL skills appear to be a distinctive factor between expert athletes and comparable non-expert peers.

Despite the relationship found between athletes' performance level and their SRL skills application, there are inconsistencies in the criteria used to define elite performance (Swann et al., 2015). The meta-analysis of Swann and colleagues (2015) revealed several comparative standards previously employed for this matter, the most common one being athletes' competitive levels. However, the authors raise an issue observed with the use of competition rankings, where the standards required to reach a higher competitive level may vary across sport disciplines. Such variations could result from differences in popularity

and/or the number of competing athletes within said sport (Swann et al., 2015). Conversely, a recommended approach prescribes to define sport eliteness through the relative performance comparison of athletes engaging in the same discipline, either within the same country or internationally (Swann et al., 2015). Such relative comparative standard is also recommended by McAuley and colleagues (2021), and will therefore be used in the present study to determine elite sport performance.

The self-regulated learning skills applied by youth athletes also appear to vary between different sport disciplines. Such proposition agrees with the principle suggested by Zimmerman (2002), which states that the SRL abilities an individual acquires are in direct relation to the type of task at hand. Furter supporting this reasoning, Jonker and colleagues (2010) investigated SRL differences among youth athletes participating in two types of sports, namely individual sports and team sports. Their research demonstrated that youth athletes performing in individual sports showed higher levels of planning and effort, in comparison to youth athletes performing in team sports. Accordingly, the use of SRL skills seems to differ based on the type of sport performed, which also suggests that certain self-regulatory skills are employed more frequently in some sport types compared to others.

In addition to varying across sport types, SRL processes were designated as beneficial for endurance sports performance (Brick et al., 2015). Endurance performance can be construed as a dynamic and whole-body physical exertion that equals or exceeds 75 seconds (McCormick et al., 2015). This definition is based upon the identified predominance of aerobic activity past 75 seconds of physical activity, which characterizes endurance exercise (Gastin, 2001; McCormick et al., 2019; Yakubovich, 2017). Further, Brick and colleagues (2015) conducted a series of interviews with elite runners to discuss their employment of self-regulatory strategies. These elite endurance athletes indicated frequently applying SRL skills by e.g., planning race objectives or adjusting their strategies based on self-monitored

performance. Such insights correspond to other findings expressing the helpful role SRL has in pain management, an issue typically arising after endurance exertion (Johnson et al., 2012; McCormick et al., 2019). Thus, the use of SRL skills seems to be an integral part of endurance sport performance, notably among elite endurance athletes.

Self-regulated learning can further profit endurance performance with regard to pacing behavior, a key element in endurance sport disciplines (Elferink-Gemser & Hettinga, 2017). Specifically, pacing refers to the process where an athlete needs to regulate and make decisions about their energy distribution during a race, in order to achieve their most optimal performance (Elferink-Gemser & Hettinga, 2017). The contribution of SRL processes to pacing behavior is already relevant among youth athletes, as it contributes to their growth towards increasingly adaptive strategies and to the enhancement of their endurance performance (Elferink-Gemser & Hettinga, 2017). This takes place through the consistent planning of pacing behavior prior to a race, the athletes' self-monitoring during task execution, and the consequent reflections and evaluations of (in)effective past strategies (Elferink-Gemser & Hettinga, 2017). Thus, the described SRL processes also appear to be an important part of endurance performance early into endurance athletes' training.

In addition to the discussion above, previous research indicated potential gender and age differences in the use of SRL skills. Several studies observed self-regulatory differences between females and males (Gupta & Mehtani, 2017; van Tetering et al., 2020; Zimmerman & Martinez-Pons, 1990). However, such effect revealed to be inconsistent, since other studies did not observe any gender differences in SRL (Anshel & Porter, 1996; Jandrič et al., 2018). This discrepancy in findings was previously notified by researchers (e.g., Hong et al., 2009). Similarly, research investigating age differences in SRL skills use also displayed mixed results. Certain studies demonstrated existing age differences in SRL processes (Jandrič et al., 2018; Zimmerman & Martinez-Pons, 1990), though other research did not support such

relationship (van Tetering et al., 2020). Henceforth, age and gender differences in SRL processes should be considered cautiously due to the inconsistent findings across studies.

To the author's best knowledge, research specifically comparing the application of SRL processes across endurance sports and non-endurance sports youth athletes seems to be lacking. Gaining insight into the characteristics of endurance performance and how it might compare to other sport disciplines would further contribute to the growing body of research in this field. The findings are additionally relevant to coaches, sport psychologists, and athletes themselves for better understanding endurance functioning in relation to mental skills use. Knowledge of SRL can be applied in trainings, for instance, to enhance the efficiency with which an athlete acquires their discipline's necessary skills (McCardle et al., 2017). Furthermore, SRL processes were consistently found to distinguish elite performing athletes from their lower performing peers (e.g., Jonker et al., 2010). The large inconsistency in defining elite sport performance needs to be addressed, however, since this affects the generalizability and comparability of research findings. In this sense, the exploration of a relative performance measure to define youth athletes' eliteness follows previous recommendations (McAuley et al., 2021; Swann et al., 2015) and aims to identify a suitable method for singling out elite performers.

The theory discussed thus far suggests that SRL skills are well-employed by elite endurance athletes (Brick et al., 2015), and are beneficial for endurance-specific demands like pacing behavior (Elferink-Gemser & Hettinga, 2017) or pain management (Johnson et al., 2012; McCormick et al., 2019). Additionally, the SRL skills most applied by youth athletes seem to vary across different sport disciplines (Jonker et al., 2010; Zimmerman, 2002). Lastly, youth athletes performing at elite levels can be distinguished from sub-elite athletes based on their application of SRL processes (Balk & Englert, 2020; Jonker et al., 2010; Jonker et al., 2015). Henceforth, the present study will be investigating differences in

reported SRL skills application between endurance and non-endurance sports youth athletes, whom are either performing at an elite or sub-elite level. The interaction between the youth athletes' sport type (i.e., endurance or non-endurance) and their performance level (i.e., elite or sub-elite) will also be examined in relation to their SRL skills use.

Predicated on the research findings introduced above, the following hypotheses are formulated. First, the present study expects differences in the SRL skills application between youth athletes performing endurance sports in comparison to those engaging in non-endurance sports. This hypothesis relates to the previous suggestion that youth athletes could be differentiated with regard to their SRL skills use due to varying discipline-specific characteristics (Jonker et al., 2010; Zimmerman, 2002). Since the application of SRL processes was related to distinctive endurance performance characteristics, such as pacing behavior (Elferink-Gemser & Hettinga, 2017), it is expected that endurance youth athletes will display particular SRL skills use, in comparison to non-endurance sports youth athletes. The exact anticipated differences in SRL processes between the sport types remain unclear, however, as such comparison was not yet investigated.

Secondly, this research expects elite youth athletes to display higher SRL skills use in comparison to sub-elite performers. The examined literature indicated that SRL processes were clear determinants in identifying elite youth athletes. Specifically, elite athletes tend to display higher and better use of SRL skills compared to sub-elite athletes (Balk & Englert, 2020; Jonker et al., 2010). These findings hold for both a generalized sport context (Balk & Englert, 2020; Jonker et al., 2010) and for endurance sports specifically (Brick et al., 2015). Additionally, past research indicates that elite athletes outperform rather consistently their sub-elite peers with regard to their reflective skills (Jonker et al., 2010) and invested effort (Jonker et al., 2015). Henceforth, the present study expects to replicate previous findings,

where elite athletes score higher than their sub-elite peers with regard to reflection and effort self-regulatory processes.

The last hypothesis expects the following interaction effect: elite endurance sports athletes will report the highest application of SRL skills due to their elite performance level and the highlighted importance of self-regulatory processes in the completion of endurance task requirements (Brick et al., 2015; Elferink-Gemser & Hettinga, 2017; Jonker et al., 2010). Following, elite non-endurance sport athletes are expected to display the next highest SRL scores due to their performance level and the consistency of previous findings regarding elite athletes' higher SRL skills employment (Balk & Englert, 2020; Jonker et al., 2010). Sub-elite endurance athletes are hypothesized to follow next in their reported use of SRL skills due to the need for SRL skills in endurance performance and their lower performance level. Finally, sub-elite non-endurance athletes are expected to score the lowest on SRL skills use due to their performance level classification and hypothesized lower necessity for SRL processes in their sport type.

Method

Participants

An a priori power analysis was performed using the software G*Power 3.1 (Faul et al., 2007) for a MANOVA. The prediction of differences in six self-regulated learning subprocesses were tested in relation to two sport types and two sport performance levels, with a small effect size (d = 0.26), an alpha of 0.05, and a power of 0.95. The two covariates were accounted for in the number of cells indicated. The yielded results showed a necessity for 109 participants to reach a power of 0.95 in the final analysis.

A total of 104 participants aged between 12 and 18 years old (M = 14.86; SD = 1.50) took part in the current study. Among them, 47 females and 57 males were present (no participant in the sample selected the third option of the gender item; see Appendix D). All participants were Dutch youth athletes attending the Topsport Talentschool in Groningen

(TTSG). The research was performed in 2019 and in 2021. A total of 43 youth athletes with an average age of 15.19 years (*SD* = 1.60) participated in 2019, which included 21 females and 22 males**.** In 2021, there was a total of 61 youth athletes with an average age of 14.62 years (*SD* = 1.40), and including 26 females and 35 males. For the study, participants completed an online questionnaire on a voluntary basis, and were not given any compensation for their participation.

Based upon their sport discipline, youth athletes were allocated to either the endurance sports group or the non-endurance sports group. As such, participants taking part in athletics (*n* = 11), speed skating (*n* = 20), short track running (*n* = 4), cycling (*n* = 4), swimming (*n* = 9), dancing (*n* = 1), and inline skating (*n* = 1) were categorized as endurance sports athletes (de Boer et al., 1987; Jonker et al., 2010; McCormick et al., 2015; McCormick et al. 2019; Patel et al., 2017). In contrast, youth athletes engaging in judo (*n* = 21), karting (*n* = 2), chess (*n* = 1), fencing (*n* = 3), taekwondo (*n* = 1), table tennis (*n* = 4), tennis (*n* = 18), gymnastics (*n* = 1), bowling (*n* = 1), skateboarding (*n* = 1), and weightlifting (*n* = 1) were grouped as non-endurance sports athletes (Ismail, 2019; Kondrič et al., 2013; Kovacs, 2006; Patel et al., 2017). There was therefore a total of 50 participants classified as endurance sports youth athletes and 54 as non-endurance sports youth athletes.

All youth athletes were considered to have a sport performance level ranging from average (sub-elite) to elite in their discipline, and were strongly invested in their sport at the time of the study (“Onze school,” n.d.). The participating youth athletes were divided between elite performers (*n* = 52) or sub-elite performers (*n* = 52). This was done based on a cut-off score that defined elite athletes as the top 27% in relative performance scores, and sub-elite as the remaining 73%. Expert performance research often lacks statistical power due to small samples (Coutinho et al., 2016). Therefore, the cut-off scores presently used favors equal sample sizes.

Materials

The present research made use of an online survey developed on the platform Qualtrics (Qualtrics, 2021). This study being part of a larger project, several other questionnaires were included in the final survey; however, only the scales relevant to the present investigation are discussed. Furthermore, as this study was conducted with Dutch youth athletes, the survey was administered in their mother tongue (Dutch) in order to avoid language barrier issues that could influence their understanding of the items. For the readability of this paper, though, the exemplified items will be presented in English.

Self-regulated Learning (SRL) was measured using the Self-Regulation of Learning Self-Report Scale (SRL-SRS) developed by Toering and colleagues (2012), and can be found in Appendix A. The SRL-SRS is composed of six subscales that individually examine the self-regulatory processes of planning, self-monitoring, self-efficacy, effort, evaluation, and reflection. Specifically, the constructs of planning, self-monitoring, self-efficacy, and effort were measured on a four-point Likert scale ranging from “almost never” to “almost always”. Example items of these subscales are, “I determine how to solve a problem before I begin” for planning (Hong & O’Neil, 2001), “I correct my errors” for self-monitoring (Herl et al., 1999), “I don’t give up, even if the task is hard” for effort (Hong & O’Neil, 2001), and “When I am confronted with a problem, I usually find several solutions” for self-efficacy (Schwarzer & Jerusalem, 1995). The process of evaluation was assessed on a five-point Likert scale ranging from “never” to “always”, with items such as “I look back at the problem to see if my answer makes sense” (Howard et al., 2000). The reflection subscale included items such as “I try to think about my strengths and weaknesses” (Peltier et al., 2006) that were scored on a five-point Likert scale, ranging from “strongly agree” to “strongly disagree”. Items of the “reflection” subscale are reversed, and therefore need to be transformed prior to data processing.

Toering et al. (2012) investigated the reliability and validity of the SRL-SRS among 11- to 17-year-old athletes, which corresponds to the age group of the participants in this study. Their psychometric exploration indicated that the test-retest reliability of its subscales had an Intraclass Correlation Coefficient (ICC) ranging between 0.70 and 0.84, and that all content and construct validities of the SRL-SRS subscales were sufficient. Additionally, the internal consistencies of planning (nine items; $\alpha = .81$), self-monitoring (eight items; $\alpha = .73$), evaluation (eight items; $\alpha = .82$), refection (five items; $\alpha = .78$), effort (10 items; $\alpha = .85$), and self-efficacy (10 items; $\alpha = .81$) subscales were designated as sufficient. The scale's reliability and validity were tested within a population of Dutch students after being translated from English to Dutch, further supporting it appropriateness for the current study. The authors also indicated the suitability of the SRL-SRS for measuring SRL processes as a stable attribute in this age group and within the sports domain.

The relative sport performance measurement was conducted quantitatively using an item from the "Sport Rapport" questionnaire (Hendriks, 2016). For this item (see Appendix B), participants were asked to indicate their relative sport performance on a scale from 0 (i.e., an "average performance level") to a 100 (i.e., an "elite performance level") using a slider. Youth athletes estimated this score by comparing their own perceived performance to that of other Dutch athletes of their age and participating in the same sport discipline. Participants that reported a performance score from 0 to 72 were grouped as sub-elite youth athletes, and those reporting a score ranging from 73 to 100 were grouped as elite youth athletes. Participants could only see the slider's positioning on the scale; the score attributed to the location of the slider was not visible to them. This questionnaire item displayed sufficient absolute reliability ($r = .78$, $p > .05$; Hendriks, 2016). Additional research investigated the scale's validity through the comparison of participants' ratings to expert ratings, and

concluded that the Sport Rapport is also sufficient for measuring current sport performance (Hijlkema, 2016).

Athletes were asked about their sport discipline with the question “Which sport do you practice?”, to which they could answer with one of the 31 different sport disciplines listed or with their own specification in a text box (see Appendix C). Because Jonker et al. (2010) found differences in SRL skills use between individual and team sports athletes, and since all endurance sports presently included are individual sports, the disciplines retained for this study were exclusively individual endurance sports and individual non-endurance sports.

Finally, the participants’ gender was indicated as either “male”, “female”, or “I would rather not say” within the demographics section of the survey. Age was determined using their birth date, specified in the format “dd/mm/yyyy” in the same survey section. Both of these items can be found in Appendix D.

Procedure

The Ethical Committee of Psychology granted their approval for the present study. Additionally, consent was given by the students and their legal guardians as an official authorization for the athletes’ participation. The online survey was created and peer reviewed prior to the data collection process. Overall, the research survey was administered once in 2019 and once in 2021, with the exception of the year 2020 due to the COVID-19 pandemic. An overview of the athletes’ names and personal participant ID was created for later use during survey completion. For the arrangement of the data collection schedule, a school member from the TTSG was contacted prior to the study. The day of the data gathering procedure, all teachers received the link to the online survey prior to their research timeslot.

Participants conducted the survey in one of the classrooms of the TTSG with desks arranged one and half meter apart, in adherence with the COVID-19 regulations enforced at the time of the study (“Plan to reopen society,” 2021). Furthermore, participants were asked

to use their personal tablet, phone, or laptop to access the link on their shared educational online platform. Throughout survey completion, one or two experimenters and a teacher from the TTSG supervised the participants. The entire survey was estimated to approximately take 30 minutes to carry out. However, to ensure sufficient time for survey completion, a total of one hour was scheduled for all participants. The items and questionnaire solely included in the present study were estimated to take 10 minutes to complete, on average.

At the start of the data collection timeslot, participants were given a general introduction to the research topic and instructions in Dutch, their mother tongue. Next, youth athletes accessed the survey's link on their personal device. A researcher read out loud the individual participant ID's successively, which were necessary to initiate the survey. Once their individual participant code was filled in, the participants proceeded with demographic questions asking for their gender and birth date. Thereafter, they indicated their sport discipline, their relative sport performance level, and finally filled in the SRL-SRS. All survey items were made mandatory to answer in order to avoid missing data.

As final procedural points, researchers provided all the clarifications participants needed regarding the survey's content during its completion. Further, the researchers remained present in the classroom throughout the execution of the online questionnaire and until every participant was finished. Once a youth athlete finished the survey, the school member present in the classroom during the data collection took responsibility of their occupation.

Data Analysis

The obtained raw data from each measurement year was prepared for further analysis in several steps, using the software IBM SPSS Statistics 28 (IBM Corporation, 2021). The questionnaire data irrelevant to the current study were removed. Over both data collection samples (2019 and 2021), there was a total of 19 participants removed from further analysis

due to missing data on one or several measures. Since the research was conducted within the same establishment over both years, certain athletes took part in the study twice. To avoid their overrepresentation in the sample, only their most recent data (i.e., from 2021) were used in the final analysis. Participants' ages were computed based on their date of birth in relation to the date of study completion. Further, reflection scores were first reversed, and mean scores for all SRL-SRS subscales (i.e., planning, self-monitoring, effort, self-efficacy, evaluation, and reflection) were calculated.

The necessary assumptions for MANCOVA were examined prior to the main analysis. A total of 14 outliers were identified and removed from further statistical analysis. Participant data were determined as outliers based on box plot visualization and calculated standardized scores with values below -3 or exceeding 3. The final sample met all necessary assumptions.

Following these steps, two descriptive analyses were performed with gender and age, respectively. Then, a MANCOVA was conducted with all six SRL-SRS subscales (i.e., reflection, evaluation, self-efficacy, self-monitoring, planning, and effort) as quantitative dependent variables, sport type (endurance, non-endurance) and performance level (elite, sub-elite) as qualitative between-subject factors, age (quantitative, 12-18 years old) as a continuous covariate, and gender (qualitative; female, male) as a categorical covariate. Results were considered at a significance level of $p < .05$. Effect sizes were interpreted using Cohen's *d*, where an effect size of 0.20 was regarded as small, effect sizes approximating 0.50 were considered medium, and effect sizes reaching 0.80 were construed as large (Cohen, 1988). The results of the MANCOVA are reported in the following section.

Results

The descriptive statistics obtained from the MANCOVA show that, irrespective of their sample group, youth athletes scored the highest on the reflection subscale ($M = 4.15$, *SD*

= .47), and further decreased with evaluation (*M* = 3.69, *SD* = .45), effort (*M* = 3.19, *SD* = .44), self-efficacy (*M* = 3.01, *SD* = 0.39), self-monitoring (*M* = 2.92, *SD* = .52), and planning (*M* = 2.89, *SD* = .46).

For this MANCOVA, the age covariate was evaluated at 14.86 years old. The analysis showed no significant multivariate main effect of age ($F(6, 93) = 2.145$, $p = .055$, $\eta_p^2 = .122$) on youth athlete's SRL skills application. This implies that age did not significantly predict SRL skills use, and therefore that youth athletes of varying ages did not significantly differ in their employment of SRL processes.

The gender covariate was estimated at a value of 1.55 in the MANCOVA conducted, where females were coded as "1" and males as "2". The final analysis showed a small significant multivariate main effect of gender on SRL skills use ($F(6, 93) = 2.233$, $p = .047$, $\eta_p^2 = .126$). However, follow-up analyses of gender effects show no significant univariate effect of gender on any of the SRL subprocesses (all *p*-values exceeded .05). Although it is unclear which SRL subscale(s) gender predicts, the multivariate main effect indicates potential differences between female youth athletes and male youth athletes in their SRL application of skills processes.

Hypothesis 1

The first hypothesis formulated for this study predicted differences in SRL skills use between endurance sports and non-endurances sports youth athletes. However, the MANCOVA conducted showed no significant multivariate main effect of sport type on SRL skills application ($F(6, 93) = .511$, $p = .799$, $\eta_p^2 = .032$). This implies that endurance sports youth athletes did not significantly differ from non-endurance sports youth athletes in their application of SRL skills.

Despite the lack of significant multivariate main effect, the yielded estimated marginal means displayed in Table 1 were further explored to identify possible directions for

the relationship between SRL processes and each sport type. The small effect size observed for planning (d = 0.22) indicates a potentially existing trend between the mean values (though presently non-significant) in which non-endurance sport athletes outscore endurance youth athletes on planning. Such trend was interpreted as non-existent for the remainder of the SRL subscales due to very low effect size values.

Table 1

Descriptive Statistics of SRL-SRS Subscales in Relation to Sport Types

SRL-SRS subscale	Likert scale range	Endurance sports (n = 50)	Non-endurance sports (n = 54)	Effect size
		$M \pm SD$	$M \pm SD$	d
Planning	(1 - 4)	2.84 ± 0.47	2.94 ± 0.47	0.22
Self-monitoring	(1 - 4)	2.95 ± 0.54	2.89 ± 0.54	0.10
Effort	(1 - 4)	3.17 ± 0.45	3.20 ± 0.46	0.08
Self-efficacy	(1 - 4)	2.98 ± 0.40	3.03 ± 0.40	0.11
Evaluation	(1 - 5)	3.67 ± 0.45	3.71 ± 0.45	0.09
Reflection	(1 - 5)	4.14 ± 0.47	4.16 ± 0.46	0.03

Note. Higher values indicate a higher use of SRL processes.

Hypothesis 2

The second hypothesis formulated for this study expected elite athletes to report a higher use of SRL skills compared to sub-elite youth athletes. The MANCOVA did not show any significant multivariate main effect of sport performance level on reported SRL skills application ($F(6, 93) = 1.241$, $p = .293$, $\eta_p^2 = .074$). These results therefore indicate that elite

youth athletes did not significantly differ from sub-elite youth athletes in their application of SRL skills.

The estimated marginal means for each SRL-SRS subscale in relation to the youth athletes' performance levels were examined, and are presented in Table 2. As can be observed, the effect sizes for estimated means in planning (d = 0.28), reflection (d = 0.29), evaluation (d = 0.31), and self-efficacy (d = 0.47) range from small to medium. These values suggest a potential trend in which elite youth athletes outscore their sub-elite peers on the four SRL subprocesses. Although these effects were non-significant, this pattern would be congruent with the formulated hypothesis. This trend is not considered present for self-monitoring and effort due to their very small effect size values.

Table 2

Descriptive Statistics of SRL-SRS Subscales in Relation to Performance Level

SRL-SRS subscale	Likert scale range	Elite performance level (n = 52)	Sub-elite performance level (n = 52)	Effect size
		$M \pm SD$	$M \pm SD$	d
Planning	(1 - 4)	2.96 ± 0.47	2.82 ± 0.47	0.28
Self-monitoring	(1 - 4)	2.96 ± 0.53	2.88 ± 0.54	0.16
Effort	(1 - 4)	3.21 ± 0.45	3.15 ± 0.45	0.13
Self-efficacy	(1 - 4)	3.10 ± 0.39	2.92 ± 0.40	0.47
Evaluation	(1 - 5)	3.76 ± 0.45	3.62 ± 0.45	0.31
Reflection	(1 - 5)	4.22 ± 0.46	4.08 ± 0.47	0.29

Note. Higher values indicate a higher use of SRL processes.

Hypothesis 3

The third hypothesis formulated expected the presence of an interaction effect between sport type and performance level on youth athletes' reported application of SRL skills. The MANCOVA yielded no significant multivariate interaction effect of the predictors on youth athletes' SRL skills application ($F(6, 93) = 0.523$, $p = .790$, $\eta_p^2 = .033$). This implies that there were no significant differences in the reported use of SRL processes between elite endurance athletes, elite non-endurance athletes, sub-elite endurance athletes, and sub-elite non-endurance athletes.

Discussion

The present study investigated differences in self-regulated learning (SRL) skills application between endurance and non-endurance youth athletes, who performed either at an elite or sub-elite level. All three formulated hypotheses for this study were rejected. Therefore, the results obtained indicated that 1) there were no differences in SRL skills use between endurance and non-endurance sports youth athletes, 2) elite and sub-elite performers showed no differences in their application of SRL processes, and 3) there was no interaction effect of youth athletes' sport type and performance level on their reported SRL skills use. Henceforth, the current findings suggest that youth athletes apply SRL processes similarly across varying sport types and sport performance levels.

This research predicted endurance sports youth athletes to use SRL skills in a different manner compared to youth athletes performing non-endurance sport disciplines. However, no such effect was found. The hypothesis related to previous research that highlighted the relevance of SRL processes to meet endurance task demands, such as pacing behavior (Elferink-Gemser & Hettinga, 2017). These endurance characteristics were therefore expected to contrast with non-endurance sports' task demands, and further translate into differing SRL skills use among youth athletes. Nevertheless, such expectations were not

met and conflict with the proposition that SRL processes are adjusted to a task's demands (Zimmerman, 2002). The present results also disagree with the idea that athletes of different sport disciplines are most clearly distinguished based on the SRL skills attuned to their sport characteristics (Jonker et al., 2010). The discrepancy found between past and current findings is further considered.

The current findings are first examined in relation to the research sample. Specifically, the youth athletes that participated all attended the same school facility i.e., the Topsport Talentschool of Groningen (TTSG; "Onze school," n.d.). A specificity of their curriculum is the Dalton program, which demands students to be independent in their academic learning ("Onderwijs," n.d.). For instance, students are asked to plan the execution of their school tasks ("Onderwijs," n.d.). Therefore, the student-athletes' adherence to the Dalton program implies that they actively develop autonomy and initiative in their academic learning trajectory, with the associated SRL skills. Previous findings indicated that the use of SRL processes in academia is positively and proportionally related to the application of SRL skills in sports (McCardle et al., 2016). Moreover, there is a possible transfer in SRL skills between the sports and academic domains (Jonker et al., 2011). Considering this relationship, the homogeneity of the sample's academic program could therefore account for similarities in SRL processes across sport types.

The present results can further be interpreted as a general lack of differences in the SRL skills used between endurance and non-endurance sport types. As aforementioned, research previously suggested that athletes of various sport disciplines show different patterns of SRL skills application (Jonker et al., 2010; Zimmerman, 2002). Such contrast relates to the necessity to apply SRL processes differently, in accordance with varying task demands across sports (Jonker et al., 2010). However, the current findings suggest the possibility that there is no variation in the SRL processes employed by endurance and non-endurance youth athletes,

or the extent to which they apply them. It is noteworthy that the SRL-SRS (Toering et al., 2012) used to collect youth athletes' self-regulatory data concretely measures the extent to which athletes use SRL skills in their sports. In other words, the scale measures whether and/or how frequently they engage in self-regulatory processes, depending on the subscale. Accordingly, specific differences of (non-)endurance task characteristics to which SRL skills are attuned could not have been detected by the SRL-SRS.

In addition to their variation across sport types, SRL skills were also investigated in relation to elite sport performance. The yielded results showed no differences in SRL skills application between elite and sub-elite youth athletes. These findings contradict former conclusions that depicted expert athletes as better self-regulators than non-expert athletes (Balk & Englert, 2020). The present study was also unable to replicate past results where elite youth athletes outperformed sub-elite ones on reflective skills (Jonker et al., 2010) and effort (Jonker et al., 2015). Additionally, this research explored the previous recommendation to use relative sport performance comparisons for determining athletic eliteness (McAuley et al., 2021; Swann et al., 2015). Specifically, elite and sub-elite youth athletes were distinguished using their self-comparison to other youth athletes in the same sport and country (Hendriks, 2016). Such approach contrasted with the most commonly used one that refers to athletes' competitive level (Swann et al., 2015). Implications of the relative performance approach, as well as the disparity found between previous results and the current findings, will be further deliberated.

The homogeneity of the research sample should also be carefully considered in this case. As was previously mentioned, all youth athletes who participated to this study attended the TTSG. This academic establishment is distinctive for recruiting top-performing youth athletes as they help them optimally combine their school and sport activities ("Onze school," n.d.). Although having access to a large number of high-performing youth athletes was

initially of interest for this elite performance research, it possibly also resulted in excessive homogeneity within the sample. Consequently, the likelihood to successfully detect variations in youth athletes' SRL processes were probably reduced, indicating a potential ceiling effect in the measurements (Taylor, 2012). The relative performance measure used (Hendriks, 2016) accounted for the generally high-performance level of the student-athletes by implementing a scale starting at an "average performance level" (instead of a "low performance level"), and rising up to "elite performance level". However, the results suggest that the sample was still too homogeneous to detect elite performers' self-regulatory differences from their sub-elite peers.

Furthermore, the current study explored the recommendation to adopt a relative performance comparison approach to distinguish athletic eliteness (McAuley et al., 2021). Despite the common use of athletes' competitive rankings to define their performance level, research debated the appropriateness of this approach (Swann et al., 2015). It is argued that the standards required to reach a certain ranking can vary to a great extent across sport disciplines and countries (McAuley et al., 2021). To remediate this controversy, the present research investigated athletic eliteness using an item from the "Sport Rapport" (Hendriks, 2016). Since this measure was not yet employed to distinguish between elite and sub-elite performance levels, a cut-off score categorizing elite youth athletes as the top 27% performers was investigated. An even distribution of participants across performance groups was favored due to the prevailing issue of small sample sizes and reduced statistical power in sport expertise research (Coutinho et al., 2016). Nevertheless, the current results indicate the probable insufficiency of this relative performance approach in distilling elite performing youth athletes from sub-elite performers. Consequently, the present findings display a lack of differences in SRL skills application between either performance groups.

A comparison of the SRL mean scores obtained in this study to those reported by Jonker and colleagues (2010) provides additional insights. Overall, both studies had analogous research designs. The elite performance group from this research was compared to junior international competitors (Jonker et al., 2010), and the present sub-elite youth athletes were contrasted with junior national competitors (Jonker et al., 2010). A general observation was that the SRL mean values obtained in the present study were higher than those from Jonker et al. (2010), and so across both performance groups. However, the comparison of both studies' high-performance groups on individual SRL subscale means still show great similarity in their values. Such resemblance in SRL mean scores was also visible when examining the lower-performing groups from both studies. Despite the analogous patterns observed, Jonker and colleagues (2010) found youth athletes to significantly differ in their reflective skills use between performance levels, while no such effect was observed in the present study. These diverging conclusions across studies can be related back to the discussion of the high-performance homogeneity in the current sample.

Noteworthy, the present study occurred during the COVID-19 pandemic, which could further explain the lack of self-regulatory differences observed between performance levels. The health crisis resulted in considerable organizational changes for trainings and competitions. For instance, athletes were required to train in isolation or through digital communication due to the numerous lockdown periods and enforced sanitary regulations (Washif et al., 2022). Overall, athletes' training time and frequency markedly decreased, and many competitive events were postponed (Jagim et al., 2019; Wong et al., 2020). In view of such disruptions, the comparative standards used in the relative performance measurement might have been affected as well. Since youth athletes needed to contrast their performance to that of other similar athletes from their last competitive season, training and competition

restrictions might have hindered their opportunities to conduct such comparison. Henceforth, the pandemic's sanitary management and related consequences on sports could also have influenced the present findings.

In addition to their isolated effects, the interactive influence of youth athletes' sport type and performance level was also examined in relation to their employment of SRL skills. Group differences were anticipated based on the discussed necessity of SRL processes to meet endurance task demands (Elferink-Gemser & Hettinga, 2017; Jonker et al., 2010; Zimmerman, 2002), as well as regarding the established self-regulatory distinction between athletic performance levels (Jonker et al., 2010; Jonker et al., 2015). Nevertheless, the yielded results showed no differences in reported SRL skills use across all groups (i.e., elite endurance, sub-elite endurance, elite non-endurance, and sub-elite non-endurance youth athletes). These findings therefore suggest that the youth athletes who participated to the present study applied SRL skills similarly, even so with varying sport types and performance levels. In consideration of the shared theoretical background between the current interaction hypothesis and that of self-regulatory processes across sport types and performance levels, the absence of interaction effect on youth athletes' application of SRL skills can be explained in a comparable manner. Such reasoning will therefore not be repeated.

This study included two covariates i.e., gender and age. Gender displayed significant variations in reported SRL skills use, while age did not show any differences. The present indication that females and males apply SRL processes in a different manner confirms past findings (e.g., Gupta & Mehtani, 2017). These results should be interpreted cautiously, however, as other studies did not observe any self-regulatory differences between genders (e.g., Jandrić et al., 2018). Furthermore, this study revealed no differences in SRL processes among youth athletes of various ages, which supports previous research findings (van Tetering et al., 2020) but also contradicts others (e.g., Zimmerman & Martinez-Pons, 1990).

It should be noted that previous studies distinguished between age groups in diverse ways, possibly influencing their subsequent conclusions. Specifically, certain studies created age groups based on participants' school grades and observed a significant age effect on self-regulatory skills use (e.g., Zimmerman & Martinez-Pons, 1990). In contrast, other studies used the participant's actual age value and found no age effect on SRL skills application (e.g., van Tetering et al., 2020). More research on differences in SRL processes across gender and age is therefore required to bring more clarity in this topic.

Study Limitations

Despite the precautions taken throughout the research process, this study presents some limitations. The use of a self-report measure poses the issue of social desirability or free recall bias in the participants' answers (Jonker et al., 2010; Reverberi et al., 2021). Additionally, the study was conducted as part of a larger project, requiring the administration of several other questionnaires. Consequently, survey completion lasted between 30 to 60 minutes, which might have been demanding for the youth athletes. There also appeared to be some confusion among participants regarding some items. For instance, some of them demanded clarification regarding the targeted time period of the questionnaire i.e., before or during the COVID-19 pandemic. Despite the explanations provided at the time of data collection, it is likely that some unclarity remained among participants.

The definition used for endurance performance also constitutes a limitation. Essentially, endurance performance was defined based on its whole-body, aerobic physiological properties (Gastin, 2001; McCormick et al., 2015; McCormick et al., 2019; Yakubovich, 2017). Based on these attributes, athletes were either classified as endurance or non-endurance youth athletes. However, this definition omitted other distinctive endurance characteristics, such as pacing behavior (Elferink-Gemser & Hettinga, 2017) or pain management (Johnson et al., 2012). Correspondingly, Hettinga and colleagues (2017) present

the issue of the reductionist approach observed in endurance performance research. This implies that certain studies solely investigate physiological mechanisms while others mainly focus on psychological processes. Consequently, the potential relationship between both domains is often disregarded. In the present case, it is therefore possible that physiological characteristics differentiating between endurance and non-endurance sports are not translatable on a psychological level. Hence, the physiology-based definition used for the current study of psychological processes (i.e., self-regulation) in endurance performance might have been inappropriate.

Suggestions for Future Research

Future studies in the field of endurance sport performance are advised to invest effort into the elaboration of a generalizable and comprehensive definition of endurance performance. Such definition is recommended to encompass both physiological and psychological characteristics of endurance exertion, as prescribed by Hettinga and colleagues (2017). The present study therefore advises a critical examination and meta-analysis of existing literature investigating endurance performance, which would help identify its fundamental components. The resulting definition would allow for greater accuracy in distinguishing endurance sports from other disciplines, contribute to enhanced comparability across studies, and provide additional robustness to the theoretical foundation of subsequent endurance research.

Although the present results confirmed certain past findings regarding age and gender differences in SRL skills use, an important controversy remains. In this respect, prospect studies are strongly recommended to examine the development of SRL skills across genders and ages using longitudinal data. The urgency of conducting longitudinally designed research was previously addressed (Elferink-Gemser & Hettinga, 2017; Jonker et al., 2010), and it appears such studies are still lacking. A longitudinal study design would help clarify the

upbringing of SRL processes among developing youth to senior athletes. It would additionally account for the methodological shortcomings mentioned above (e.g., the way in which age groups are determined) that likely result in inconsistent findings.

Furthermore, subsequent research is encouraged to persevere in the investigation of elite sport performance. The present study pointed out the urgent need to find a reliable and validated method to distinguish elite youth athletes from sub-elite ones. This is necessary to establish consistency and comparability between expert performance studies (Coutinho et al., 2016; McAuley et al., 2021). Several approaches to determining eliteness have been adopted in the past, such as the use of competitive levels (Jonker et al., 2010) or the relative performance approach in the current study. The defining constituents of elite performance remain unclear, however, and should be further addressed. In this regard, prospective studies are encouraged to investigate and compare the reliability and validity of previously used methods for determining expert performance. Future studies are also advised to further explore the relative performance comparison approach e.g., with different cut-off scores or scales, as the present research only initiated a primary attempt. Lastly, subsequent investigations should also consider gathering data from a larger variety of youth athletes e.g., attending different schools and/or sport clubs to reduce homogeneity within the sample and enhance future results' generalizability.

Practical Implications and Conclusions

The present research findings further contribute to the field of sport performance psychology, specifically regarding the application of SRL processes among youth athletes. Part of this study gathered new insights on endurance sports performance. An absence of comparative studies between endurance and non-endurance sport disciplines was noticed, especially in relation to self-regulatory processes. In addition, previous studies highlighted the relevance of SRL skills in relation to endurance tasks performance (Brick et al., 2015;

Elferink-Gemser & Hettinga, 2017). Henceforth, the present study was motivated to further contribute to the understanding of mental skills in relation to endurance performance and its comparative non-endurance sports performance. Furthermore, developing an understanding of athletic eliteness is pertinent to sport talent development research. For instance, gaining awareness of the characteristics defining top-performing athletes or the manner in which athletes could enhance their expertise in their discipline, is of interest to this field. The findings generated in this study are aimed to be applied by sport psychologists, coaches, and athletes to appropriately support youth athletes' utilization of self-regulatory skills in consideration of their sport discipline and their performance level.

In conclusion, the present study explored differences in the application of SRL skills between endurance and non-endurance sports youth athletes, either qualifying as elite or sub-elite performers. The obtained findings did not demonstrate any variation in SRL skills use among youth athletes, despite contrasting sport types and performance levels. This was presumably related to the sample's homogeneity, as all participants were high-performing and self-regulating student-athletes. Nevertheless, the current research provided an opening on comparative studies between endurance and non-endurance sport disciplines. Following previous recommendations, this study additionally explored a relative performance comparison approach to distinguish between elite and sub-elite performers. Finally, future research is encouraged to persist in a comprehensive investigation of the SRL processes occurring in endurance performance, and to maintain their effort in the unfolding of self-regulation's role in athletic eliteness.

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Appendix A

Self-Regulation of Learning Self-Report Scale (SRL-SRS), as Presented in the Online Survey

De volgende 46 vragen gaan over hoe je problemen oplost en taken uitvoert in jouw **sport**. Dit kunnen allerlei problemen en taken zijn, **die zich voordoen bij jouw sport**. **Kruis** het antwoord aan dat **het beste bij je past**. Er zijn **geen** goede of foute antwoorden mogelijk.

HERINNERING: DENK AAN JOUW SPORT

Bijna nooit = als je dit **bijna nooit** doet, of als deze uitspraak **niet** bij je past
Soms = als je dit **soms** doet, of als deze uitspraak **een beetje** bij je past
Vaak = als je dit **vaak** doet, of als deze uitspraak **goed** bij je past
Bijna altijd = als je dit **bijna altijd** doet, of als deze uitspraak **helemaal** bij je past

TIP: met het maken van een plan wordt bedoeld dat vóórdat je iets doet, je bedenkt hoe je dat stapje voor stapje gaat doen. Je probleem is bijvoorbeeld dat je de dagelijkse trainingsoefeningen nog moet doen, je nog af wil spreken met een vriendin, maar je ook nog dingen moet regelen voor je wedstrijd dit weekend. Je plan kan dan zijn dat je eerst je dagelijkse trainingsoefeningen gaat doen, je daarna je wedstrijd gaat regelen en dan kijkt of je nog tijd hebt om met je vriend(in) af te spreken. Zodat je het belangrijkste in ieder geval hebt gedaan.

Voordat ik met oplossen begin, bedenk ik hoe ik een probleem zal oplossen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik blijf doorwerken, ook als ik de taak moeilijk vind

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik weet hoe ik met dingen die onverwacht gebeuren om moet gaan, omdat ik goed manieren kan bedenken om met nieuwe dingen om te gaan

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik ga de stappen van een plan die ik moet volgen in mijn hoofd na

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik doe mijn uiterste best bij het uitvoeren van taken

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Terwijl ik een taak uitvoert, controleer ik hoe goed het gaat

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik met een taak bezig ben, concentreer ik me helemaal

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik stel mezelf vragen over wat ik voor het oplossen van een probleem moet doen en daarna los ik het probleem op

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik controleer mijn werk, terwijl ik ermee bezig ben

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik geef niet op, ook als de taak moeilijk is

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik vertrouw er op dat ik goed zal kunnen omgaan met dingen die ik niet had verwacht

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik werk hard aan een taak, ook als deze niet belangrijk is

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik vastloop, kan ik iets bedenken om te doen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik ga de stappen van een plan die ik nog moet voltooien in mijn hoofd na

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Terwijl ik de taak uitvoer, vraag ik mezelf af hoe goed ik het doe

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik werk zo hard mogelijk aan al mijn taken

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik maak een precies plan voor het oplossen van een probleem

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik blijf rustig bij moeilijkheden, omdat ik genoeg manieren weet om met moeilijkheden om te gaan

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik werk hard om het goed te doen, ook als ik een taak niet leuk vind

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik verbeter mijn fouten

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik niet goed ben in een taak, dan kan ik dit goedmaken door hard te werken

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik goed genoeg mijn best doe, lukt het mij moeilijke problemen op te lossen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik zoek uit wat ik wil bereiken en wat ik moet doen om deze dingen te bereiken

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik mijn best blijf doen op een taak, denk ik dat ik uiteindelijk zal slagen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Het is makkelijk voor mij om me te concentreren op de dingen die ik wil bereiken en om deze dingen te bereiken

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Terwijl ik verder ga met een taak, controleer ik of ik wel nauwkeurig ben

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik plan mijn manier van handelen om een probleem op te lossen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik genoeg mijn best doe, kan ik de meeste problemen oplossen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Als ik een probleem tegenkom, weet ik meestal meerdere oplossingen

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik ben bereid meer aandacht aan taken te besteden, zodat ik meer leer

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik bedenk een plan voor het oplossen van een probleem

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Wat er ook gebeurt, ik kan het wel aan

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik beoordeel hoe goed mijn werk is

- ○ Bijna nooit
- ○ Soms
- ○ Vaak
- ○ Bijna altijd

Ik denk aan wat ik heb gedaan en controleer of het klopt

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik controleer dingen extra goed om er zeker van te zijn dat ik het goed heb gedaan

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik controleer of mijn berekeningen goed zijn

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik denk terug om te zien of ik de juiste dingen heb gedaan

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik controleer telkens mijn werk, als ik een probleem aan het oplossen ben

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik denk terug aan een probleem om te zien of mijn antwoord verstandig was

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik stop en denk na over een stap die ik al gemaakt heb

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik zorg ervoor dat ik elke stap afmaak

- ○ Nooit
- ○ Zelden
- ○ Soms
- ○ Vaak
- ○ Altijd

Ik beoordeel de dingen die ik heb meegemaakt, zodat ik ervan kan leren

- ○ Helemaal mee eens
- ○ Mee eens
- ○ Weet niet
- ○ Mee oneens
- ○ Helemaal mee oneens

Ik probeer na te denken over mijn sterke en zwakke punten

- ○ Helemaal mee eens
- ○ Mee eens
- ○ Weet niet
- ○ Mee oneens
- ○ Helemaal mee oneens

Ik denk over mijn acties na, zodat ik ze kan verbeteren

- ○ Helemaal mee eens
- ○ Mee eens
- ○ Weet niet
- ○ Mee oneens
- ○ Helemaal mee oneens

Om nieuwe dingen te begrijpen, denk ik na over de dingen die ik al heb meegemaakt

- ○ Helemaal mee eens
- ○ Mee eens
- ○ Weet niet
- ○ Mee oneens
- ○ Helemaal mee oneens

Ik probeer na te denken over hoe ik dingen de volgende keer beter kan doen

- ○ Helemaal mee eens
- ○ Mee eens
- ○ Weet niet
- ○ Mee oneens
- ○ Helemaal mee oneens

Appendix B

Relative Sport Performance Item From the "Sport Rapport", as Presented in the Qualtrics Survey

Hoe beoordeel jij jouw sportprestatie in dit seizoen ten opzichte van jouw Nederlandse leeftijdsgenoten die dezelfde sport beoefenen?
Sleep *het streepje naar waar jij denkt dat jouw niveau ligt.*

LET OP: de streep start op gemiddeld niveau en loopt tot absolute top (de beste binnen jouw leeftijdscategorie).

	Gemiddeld niveau	Absolute top
Sportprestatie		

Appendix C

Item Measuring the Sport Discipline of Youth Athletes, as Presented in the Online Survey

Welke sport beoefen je?

- ○ Acrogym
- ○ Atletiek
- ○ Basketbal
- ○ Bowlen
- ○ Dammen
- ○ Floorball
- ○ Handbal
- ○ Hockey
- ○ IJshockey
- ○ Judo
- ○ Karten
- ○ Korfbal
- ○ Kunstschaatsen
- ○ Paardrijden
- ○ Roeien
- ○ Schaatsen
- ○ Schaken
- ○ Schermen
- ○ Skiën

- ○ Shorttrack
- ○ Squash
- ○ Taekwando
- ○ Tafeltennis
- ○ Tennis
- ○ Turnen
- ○ Voetbal
- ○ Volleybal
- ○ Waterpolo
- ○ Wielrennen
- ○ Zeilen
- ○ Zwemmen
- ○ Anders, namelijk _____

Appendix D

Items Measuring Age and Gender, as Presented in the Online Survey

Wat is jouw geslacht?

- ○ Meisje
- ○ Jongen
- ○ Dat zeg ik liever niet

Wat is je geboortedatum? Vul in: **dd/mm/jjjj**

_____
