



## “Overcoming the slumps in performance”: Metacognition, Grit and Self-Efficacy in sports among athletes

Kashish Pandey<sup>1</sup>, Khusboo K<sup>2</sup>

<sup>1</sup>Ph.D Scholar, <sup>2</sup>Assistant Professor

<sup>1</sup>Department of Applied Psychology, Faculty of Behavioural and Social Sciences,

<sup>2</sup>Department of Applied Psychology, Faculty of Behavioural and Social Sciences, Manav Rachna International Institute of Research and Studies, Faridabad, Haryana, India.

**Abstract:** Predictably, millions of dollars get invested in sport science by the federation for impeccable performance of an athlete. However, there is a gap which exist to understand the nature of cognitive-motion nexus in sports with regard to performance. Hence, this systematic review synthesized evidence on the influence of metacognition, grit and self-efficacy on performance in sport domain using PRISMA guidelines. A search of Web of Science, PubMed, Google Scholar, PsycINFO and Scopus databases reaped 26 eligible studies. Findings were classified into three domains namely metacognitive inferences, feedback for grit and role of self-efficacy. Grit is positively correlated with metacognition and self-efficacy. We conclude by encouraging the sports system to foster the skills of these constructs.

**Keywords:** metacognition, grit, performance satisfaction, athlete, sports

### Introduction

#### 1. Performance as a pre-requisite

In the words of Ericsson (2009, p.18) “performance can be publicly observed and even objectively measured in open competition and public performances.”

Performance satisfaction for an athlete is pre-requisite for athletic identity, financial gain, ranking, reputation and sponsors. The former is determined by multiple factors (Kirschen et al., 2020). Achievements do not come easily in the field of sports. In order to effectuate the same, the athletes have to persevere and maintain their consistency for longer period of time (Weinberg, 1994; Duckworth, 2007). Both, physical such as stamina, endurance, strength etc., and mental abilities (Moran, 2011; Moran, 1996) play indispensable role in affecting the performance. Athletes whether novice or elites, have to execute their task under complex environment (Baker & Young, 2014). Solely, kinaesthetic skills cannot serve the purpose of performance optimum of athletes. Awareness, self-regulation, cognitive-reinstruction are key components (Neitfield, 2003; MacIntyre & Moran, 2007b; MacIntyre & Moran, 2010). These skills help athlete to achieve laurels for the country. These skills are imbibed in the athletes through sport psychology interventions (Church, Rumbold & Sandars, 2017; Brown & Fletcher, 2017).

#### 1.1 Performance and Metacognition

While delivering performance, athletes are required to focus and *re-focus* to keep the distractions away. Focus and concentration while regulating cognition is important to focus on task at hand (Moran, 2011; Moran, 1996; Oliver, McCarthy & Burns, 2021). As metacognition is higher order level cognition (Flavell, 1979). It is an athlete’s thinking about one’s his/her thinking. Metacognition has several components such as procedural knowledge and declarative knowledge (see figure 1). A 100m sprinter who knows how to perform a dash within stipulated time is likely to have declarative knowledge whereas the same sprinter who knows how-to run-on toes will constitute of procedural knowledge It executes self-regulation also (Tarricone, 2011).

High level performers set standards to meet their performance (MacIntyre et al., 2014). It varies from sports to sports. Sport aces adjust their strategies accordingly to meet such standards. This requires higher cognitive processes which can be achieved by metacognition. Also, Neeraj Chopra uses self-talk as part of his performance routine to make himself alert and prepared which describes his level of awareness and metacognitive strategy during Olympics 2020, as reported by (What Makes Neeraj Chopra so Good? Athleticism, Thought Process, Sprinting Speed., 2021).

“How can I do it better? What should be the movement of my glutes? What if I block this way?”

Therefore, metacognitive processes are present across sports and work simultaneously with movement execution. Cognition and action work in parallel form thus acquiring the proficiency in mental skills become prominent.

### 1.2 Performance and grit

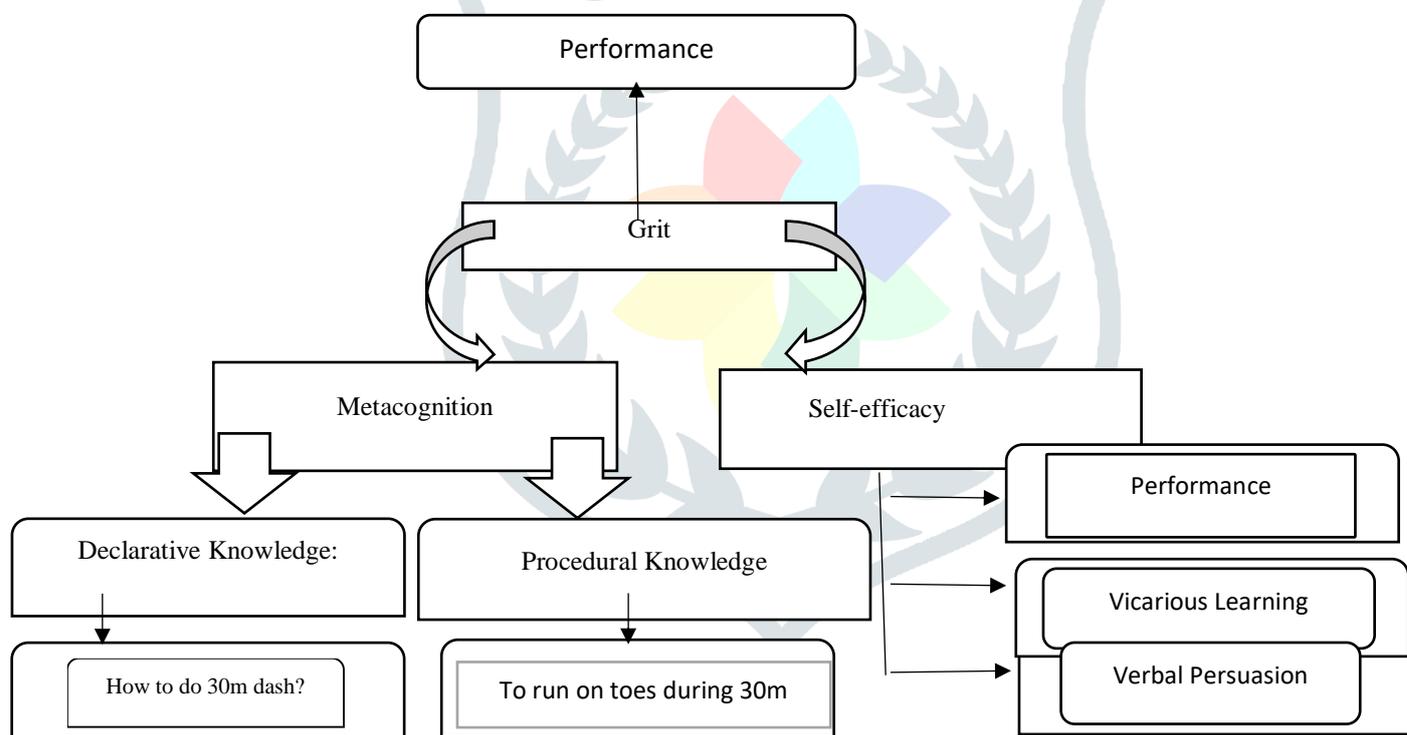
However, there are several obstacles which might jeopardize an athlete's career. Injury (extrinsic or intrinsic) ban (doping) relationship problems, communication problems with coach, lack of support from family or even Covid-19 pandemic, just to name a few (Grix et al., 2021). In order to overcome these arduous challenges, athletes are required to "stick through" their goals. This can be effectuated with grit (Duckworth, 2007; Doorely, 2020). It has two components which are perseverance of efforts and consistency of interests (Duckworth, 2013). Grit cannot be inherited rather it can be learned through growth mindset (Duckworth, 2013). Prior research has shown the contribution of grit towards performance (Lonel, Ion, & Visu-Petra, 2021; Moles et al., 2017; Ansah & Apaak, 2019; DeCouto et al., 2019).

### 1.3 Performance and self-efficacy

Self-efficacy is defined as the individual belief of his/her effectiveness (Bandura, 1977). An athlete builds his/her self-efficacy through various sources such as verbal persuasion (i.e., when coach engages in positive talk with an athlete), performance accomplishment (achieving the performance benchmark and feeling powerful) and vicarious learning such as modelling an athlete and able to execute the similar task, as shown in figure 1. It helps to achieve performance (Durovic, Popov, & Soki, et al., 2021). Various factors play an important role while determining self-efficacy of an athlete such as age, sex, skills, practise sessions etc (Romero, Garrido-Guzman, Vazquez, 2022).

### 1.4 Metacognition, grit and self-efficacy

Metacognition is required for an athlete to achieve performance through focus and inward attention (Rogowska, Tataruch, Niedzwiecki, et al., 2022). Self-efficacy plays an important mediator between motivation and performance of an athlete (Moritz, Feltz, & Fahrbach et al., 2000). According to Moritz, Feltz, Fahrbach, & Mach (2000) self-efficacy and performance are positively related with positive moderate correlation of (.38). Grit also has been positively linked with self-efficacy. Ciaccio et al., (2019) conducted a study on 366 university students where he found that grit component perseverance of efforts was positively linked with self-efficacy as compared to consistency of efforts as depicted in Figure 1. According to Arslan, Akin, & Citemel, (2013) grit is positively related with metacognition which was tested using correlation and multiple regression analysis. Therefore, grit shows a significant contribution on metacognition and self-efficacy in sports as shown in Figure 1.



(Figure.1 Proposed conceptual model)

## 2. Present Study: Expectations!

Thinking and action are opposite polars. Therefore, executing them parallelly is worth of review. Cognitive researchers and cognitive sport psychologists have succumbed to the idea of accommodating cognition in action (MacIntyre et al., 2013). But still, there had been a paucity on the motion-cognition nexus. Also, there has been lack of Indian literature on metacognition grit and self-efficacy among track and field sport. Hence, this article harps on understanding the role of these constructs on performance among elite and novice athletes.

### Gap Analysis

#### Research question:

This paper objectives were to: a) identify metacognition, grit and self-efficacy in sports with regard to performance including the type of studies whether longitudinal, cross-sectional, b) establish the scope c) certain key gaps that must be adhered to while moving forward, d) need for a narrative overview which can create further avenues to work on this area. For this purpose, metacognition was operationally defined as when an individual can think about his/her cognition (Flavell, 1979), grit is the dispositional tendency towards

passion and perseverance for long term goals (Duckworth, 2007) and self-efficacy is the ability of an individual's belief of his/her effectiveness (Bandura, 1977). These definitions are exclusive of non-sport/leisure/pass-time physical activity or sports for recreation.

### 3. Methodology

#### 3.1 Protocol

The report has followed the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009a). For this purpose, Web of Science (WOS), PsycINFO and SCOPUS were employed as the main search engines.

#### 3.2 Eligibility Criteria

Research papers only in English were considered. For inclusion in the review, following were the necessary criteria:

Participants: Junior, youth and senior level athletes.

Eligibility of constructs: Through modelling or verbal persuasion as the sources of self-efficacy, presence of metacognitive strategies/inferences and gritty athletes.

Outcome: Better performance or significant contribution in sports validated through quantitative or qualitative approach.

Studies published in peer-reviewed journals with full text available in English, including narrative/systematic and meta-analyses, longitudinal, experimental designs, cross-sectional studies incorporating the keywords.

#### 3.3 Search Strategy

The systematic review was carried out between 14<sup>th</sup> March 2021 to 10th April 2022 and focused on studies which analysed the effects of metacognition, grit and self-efficacy on performance among athletes. The keywords metacognition grit, athletes, sports performance were explored using Boolean operator "and" being used. Truncations were used for keywords.

#### 3.4 Data Extraction

Papers were downloaded and stored in the library of Mendeley reference management software. Post literature, duplicates were removed and screening was done. The purpose of screening was to eliminate the insignificant studies. Data comprised of authors, publication date, study design and analysis used along with sample size.

### 4. Data Analysis

Since the outcomes varied, so the authors of this paper were unable to conduct meta-analysis. Narrative synthesis has been executed which also focused on moderating variables.

### 5. Results

The literature search yielded 6598 articles from the bibliographic databases. After 3200 duplicates were removed, screening for 3398 articles were done. Remaining articles were screened on abstract, with removing of 1300 papers. On reading 98 full papers, 72 papers were removed considering the age range. Total 26 papers were left which fitted the criteria. The PRISMA (Moher, Liberati, Tetzlaff, & Altman, 2009a) flowchart (Figure 2) provides further details.

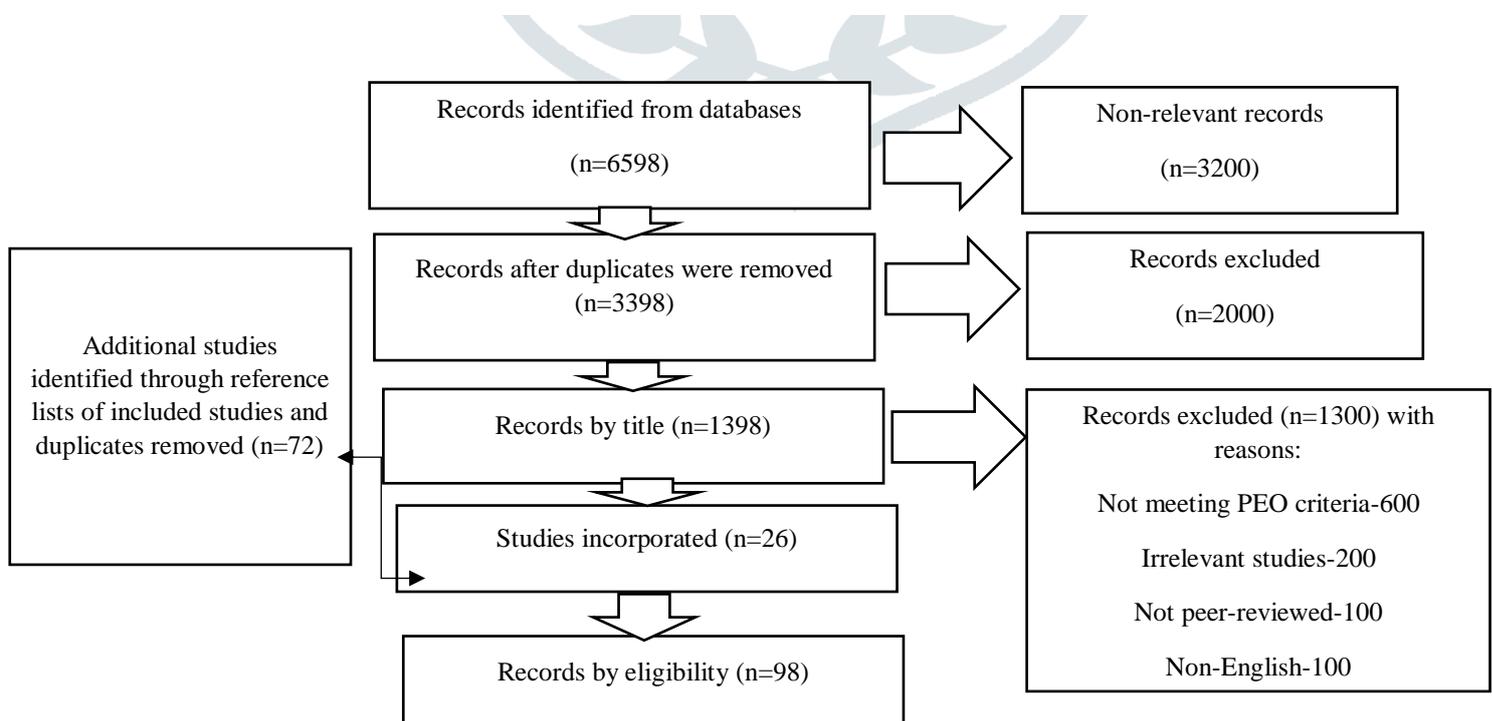


Figure 2. PRISMA 2009 Flow Diagram

## 6. Description of studies

The review papers have been summarized in Table 1. Overall, majority of the studies were quantitative out of which only 1 study was longitudinal and rest were cross-sectional. Rest was qualitative followed by meta-analyses and review studies. Moderating effects of self-efficacy was also found in two of the studies (Besharat & Pourbohlool, 2011; Jan et al., 2015). Six studies were focused on self-efficacy and its relation with performance while metacognitive inferences including meta-attention, meta-imagery with regard to performance were nine in total (Nietfield, 2003; MacIntyre & Moran, 2010; Decaro et al., 2011; Brick, MacIntyre, & Campbell, 2015; Love, Kannis-Dymand, & Lovell 2018; Oliver, McCarthy, & Burns, 2021; Love, Kannis-Dymand, & Lovell 2021). Eleven studies primarily focused on grit and three of the studies pointed its relation with self-efficacy and metacognition (Arslan, Akin, & Citemel, 2013; De La Cruz et al., 2021; Cormier et al., 2021) which was highlighted in the proposed-contextual model above (see figure 1). Contrary to the proposed model, two of the studies did not show the contribution of grit on athletic performance (Criticos et al., 2020; Fawver et al., 2020).

**Table 1. Summary of Studies**

Study	Aim	Design and sample	Findings/results
Moritz et al., (2000)	To understand the relationship between self-efficacy and performance in sport through meta-analysis.	Meta-analysis had been adopted. 45 studies (102 correlations) reflected the correlation between the two were .38.	This study laid emphasis on self-efficacy linked with performance but through moderator such as concordance. Other moderators were nature of task, timing etc. Which accounted for 44% of the variance.
Nietfield (2003)	To understand the role of metacognition (meta-attention) among athletes	Quantitative approach; survey method	Runners primarily used monitoring, strategy thoughts, during their drills and competition which shows the indispensable nature of metacognitive skills.
Wells, Collins, & Hale (2007)	To discover if self-efficacy has an effect on strength performance in sports context	Experimental study N=24 participants had been recruited; self-efficacy was measured using physical self-efficacy scale	Self-efficacy is considered to be a situation specific construct and can be manipulated and is linked to both past and future performance.
Schunk (2008)	To discover the role of self-efficacy to motivation and performance in sport domains.	Conceptual study	Self-efficacy helps to predict performance in the sport domains.
MacIntyre & Moran (2007b)	To understand meta-imagery and performance among elite athletes	Qualitative approach	It was revealed that elite performers had exceptional meta-imagery skills which enabled them to achieve peak performance.
MacIntyre & Moran (2010)	To understand the role of metacognition and its components on experts' performance in sports	Conceptual	A model has been proposed which focused on meta-imagery for understanding expertise effects.
Decaro et al., (2011)	To understand the metacognitive awareness among athletes and its consequences	Quantitative; experimental	Increased metacognitive awareness caused performers to evaluate their performance
Besharat & Pourbohlool (2011)	To analyse the moderating effects of self-efficacy on competitive anxiety and performance.	Quantitative method; survey method, n=246 (149 males & 97 females)	Sport self-efficacy moderated between the two variables.

Arslan, Akin, & Citemel (2013)	To understand the predictive role of grit on metacognition	Quantitative approach, cross sectional study. 352 university students were taken for the survey	Grit is positively correlated with metacognition.
Wright, O'Holloran & Stukas (2015)	To assess the self-efficacy sources on self-efficacy and performance.	Within-subject design was performed with 2 trials for 3 performance enhancement techniques and between-groups design assessed differences between pets for 3 novel tasks. (N=96)	Self-efficacy sources such as verbal persuasion is more effective in enhancing the performance of an athlete as compared to modelling. Partial support for the sources of SE has been reflected in this study.
Jan et al., (2015)	To understand potential antecedents for performance satisfaction among athletes	Quantitative approach N=197 athletes (57.4% women and 54.7% representing team). Measurement was repeated in three follow up (n=107).	Sequential multiple mediation analysis revealed the association between self-efficacy and performance satisfaction among athletes at a follow-up was mediated by introjected regulation and personal-barrier self- efficacy.
Brick, MacIntyre, & Campbell (2015)	To assess metacognitive processes in the self-regulation of performance in elite runners.	Qualitative method; content analysis had been done. Semi-structured interviews had been conducted. N=10 runners.	Findings indicated that metacognitive strategies such as planning, monitoring are important during running as elite runners use them while running.
Moles, Auerbach, & Petrie (2017)	To explore the moderating effects of grit on motivational feedback and sport performance	71 high adolescent soccer players were used for this study on a kicking task.	Grit had been significant moderator on motivational feedback especially mastery one as opposed to ego one. With 3.9% variance, grit was a significant moderator of the feedback -shooting performance. The feedback matters especially for those athletes who are lower in grit.
Love, Kannis-Dymand, & Lovell (2018)	To explore the role of metacognition and its beliefs during performance.	Quantitative approach; survey method (n=119) triathletes were recruited, \$100 gift vouchers had also been given as incentives.	Positive beliefs while using meta-cognitive strategies can be helpful pre and during performance as compared to having negative beliefs about worry about the performance.
Ansah & Apaak, (2019)	To understand the role of grit on performance	Quantitative study; survey method done on 644 university athletes	Grittier athletes were more likely to win medals.
Sivrikaya (2019)	To discover the role of self-efficacy on performance of sport skills of football athletes	Quantitative approach; survey method N=52 participants (18-22 yrs. Old)	Self-efficacy is crucial for an athlete to succeed as it plays a pivotal role in performance.
Doorley (2020)	To explore grit with performance, negative and positive emotions and self-compassion in sports	Quantitative approach; survey method, longitudinal	Grit showed improvement in performance in those athletes who were gritty and grit was correlated with positive emotion, self-confidence but unrelated with self-compassion in sports.
Criticos et al., (2020)	To understand the role of grit, anxiety among track and field throwers	Quantitative study	Grit does not predict performance

Fawyer et al., (2020)	Assessment of psychological characteristics such as grit, sport engagement and performance	Retrospective design n =169 skiers were recruited with 88 women out of them	Grit did not emerge as significant contributor for athletic performance
Albert (2020)	Grit component persistency of efforts (pe) was studied with mastery-involving motivational climate and ego-involving motivational climate	Quantitative; survey method with sample size, n=523 on collegiate level athletes was examined.	PE was unrelated to ego-involving motivational climate whereas mastery-involving motivational climate explained 65% change in PE. This further impacted the performance of the collegiate athletes.
Albert et al., (2021)	To explore grit with mastery goal orientation and task-involving climate	Quantitative; survey method with sample size, n=81 comprising of youth athletes	Grit of an athlete was linked with mastery goal orientation but not with task-involving climate ( $\beta = .33, \rho = .03$ )
Cormier et al., (2021)	To understand the ameliorating effects of grit as a construct in sport context	A scoping review	Grit has various implications in sport context however with other variables also such as hardiness, resilience, self-efficacy etc. Designing and testing of interventions with regard to grit is required along with more robust method.
Oliver, McCarthy, & Burns (2021)	Understanding role of meta-attention among golfers in their performance.	Immediate level golfers (m=14.43) had to perform over 6 holes using think aloud level to analyse metacognitions, strategies during performance.	Findings revealed that golfers focus on their attentional focus during performance which indicates that golfers need high attentional focus and concentration to achieve performance.
De La Cruz et al., (2021)	To understand grit, self-efficacy towards exercise behaviour.	Quantitative study; n=391 adults aged between 18-64 years old were recruited. Structure equation model was used to test the relation between the two.	Grit is positively linked with self-efficacy.
Love, Kannis-Dymand, & Lovell (2021)	To understand the role of metacognitions during performance with the flow.	Quantitative method; survey approach, bivariate correlation along with stepwise regression had been conducted with (n=173 and in-event n=76).	Sports-specific metacognitions Predicted flow during performance which enhanced the performance of the athletes.
Lonel, Ion, & Visu-Petra, (2021)	The aim was to explore if grit leads to performance in high level sports such as rock climbing	Cross-sectional research Sample size (n=272 sport climbers with 155 boulderers)	Grit significantly predicts climbing performance and has a unique contribution in explaining performance in a novel, high-risk sport.

## 7. Analysis of results

Key findings of the studies have been discovered and synthesized accordingly into 3 domains namely metacognitive inferences, feedback for grit and role of self-efficacy. Metacognitive inferences included studies which focussed on meta-attention, meta-imagery, metacognitive functions. Feedback for grit included those studies which made athletes grittier due to feedback given by coaches or others thus improving their performance in long run. And, self-efficacy sources were relevant to understand its impact on performance.

### 7.1 Metacognitive inferences

Elite runners used planning, monitoring while running which helped them in their performance (Neitfield, 2003; MacIntyre & Moran, 2007b; MacIntyre & Moran, 2010; Brick, MacIntyre, & Campbell, 2015). Whereas, Love, Kannis-Dymand, & Lovell (2021) highlighted the role of metacognitive strategies with flow pre and during performance among triathletes. On the other hand, Love, Kannis-Dymand, & Lovell (2018), highlighted the role of positive and negative metacognitive beliefs and its impact on performance. Decaro, (2011) discussed the importance of metacognitive awareness while performing during competition.

### 7.2 Feedback for grit

Grit has been seen as a moderator in wide variety of studies (Moles, Auerbach, & Petrie, 2017; Albert et al., 2021) This points to the inference that athletes can be grittier through growth mindset and feedback especially motivational. Doorley (2020) discussed grit with other variables and its impact on performance. Lonel, Ion, & Visu-Petra (2021) elucidated the importance of grit for rock climbers as it helped them to achieve novel sport performance. De La Cruz et al., (2021) encapsulated the role of grit with self-efficacy which is positive and also with metacognition (Arslan, Akin, & Citemel, 201; Cormier et al., 2021). However, grit did not emerge as a significant predictor of sport performance in two studies (Criticos et al., 2020; Fawver et al., 2020).

### 7.3 Role of Self-efficacy

Researchers (Besharat & Pourbohloul, 2011; Moritz et al., 2000) proved in their study about the role of self-efficacy as a moderator between other constructs whereas Schunk (2008) pointed out that self-efficacy is positively linked with performance. Although some sources of self-efficacy are effective whereas some are not. Verbal persuasion is more impactful than modelling (Wright, O'Holloran & Stukas (2015). Whereas, Wells, Collins, & Hale (2007) encapsulated that this construct can be manipulated and impacts past and present performance. Although Sivrikaya (2019) discussed the importance of self-efficacy for an athlete to achieve peak performance.

### 7.4 Confounding Factors

Mortiz et al., (2000) found concordance as a moderator between self-efficacy and performance. Whereas, Moles, Auerbach, & Petrie (2017) found grit as a moderator between motivational feedback and performance. Besharat & Pourbohloul (2011) highlighted about self-efficacy as the moderator between competitive anxiety and performance.

## 8. Discussion

The present systematic review examined the evidence for metacognition, grit and self-efficacy with regard to performance in the sport context. Amongst 26 studies, grit is found to be the strongest as it is also positively related with metacognition and self-efficacy. Correlation is evident but "causation" needs more work in the future. This review shows correlation between these three constructs through moderating variables also. As per the proposed-contextual model, the observed relationship through the results is complex for straightforward model. Some studies have used the same constructs as moderating variables Besharat & Pourbohloul, 2011; Moles, Auerbach, & Petrie, 2017). Although some studies do highlight the role of age, sex on being grittier and metacognitive strategies are adopted by older people more than younger people but it did not have direct contribution in the performance. Further work is required to understand the other caveats.

## 9. Conclusion

The role of metacognitive strategies, grit and self-efficacy does contribute in performance in sport settings but it needs to be backed up with more scientific findings. As per the model proposed, grit impacting metacognition and self-efficacy needs more work as it is multifactorial in nature. Causation has not been reviewed in the studies hence causation cannot be proved. Relationship is correlational but not causative. Key findings of the study have summed up in three domains which are metacognitive inferences, feedback for grit and nature of self-efficacy. There are still unexplored mediators and moderators which may explain the direction of the relationship. Also, as per the proposed contextual model, some studies proved the role of grit as a predictor of athletic performance but two of the studies showed no predictor effects of grit on the performance, hence more rigorous work in the future is needed and that has been acknowledged by the authors of this study.

## 10. Limitations and Future Scope of the Study

This systematic review does contribute to the existing literature but there are certain limitations which have been acknowledged by the authors. First, meta-analysis has not been conducted. Second, many studies out of 26 studies were cross-sectional which does not show causal relationship. In certain studies, the sample size was too small for generalizability along with convenient sampling hence replication becomes arduous. Further, grit as construct contributing to metacognition and self-efficacy is still complex and further investigation is required. Future scope can include conduction of more longitudinal studies to understand scientific findings for the model. More moderating and mediating variables needs to be explored which can explain the direction of the relationship.

## 11. Data Availability Statement

All the possible contributions have been inclusive of this study, for further material, the corresponding author can be contacted.

## 12. Funding

This work has been not funded by any agency; it has been solely prepared by all the dedicated authors.

## 13. Conflict of Interest

There was strict absence of any kind of financial/emotional/personal interest which might have led to conflict of interest.

**References**

- Ansah, E. W., & Apaak, D. (2019). Safety behaviour and grit in sports performance among Ghanaian University Athletes. *African Journal for Physical Activity and Health Sciences*, 25(3), 418–432.
- Albert, E., Petrie, T. A., & Moore, E. W. G. (2021). The relationship of motivational climates, mindsets, and goal orientations to grit in male adolescent soccer players. *International Journal of Sport and Exercise Psychology*, 19(2), 265–278. <https://doi.org/10.1080/1612197X.2019>.
- Albert, E. (2020). Achievement motivation theory as a model for explaining college athletes' grit [Doctoral dissertation]. University of North Texas. UNT Digital Library.
- Arslan, S., Akin, A.C., & Çitemel, N. (2013). The predictive role of grit on metacognition in Turkish university students. *Studia Psychologica*, 55, 311-320.
- Baker J., Young B. (2014). 20 years later: deliberate practice and the development of expertise in sport. *International Review of Sport and Exercise Psychology*, 7(1). 135–157. <https://doi.org/10.1080/1750984X.2014.896024>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Brick, N., MacIntyre, T., & Campbell, M. (2015). Metacognitive processes in the self-regulation of performance in elite endurance runners. *Psychology of Sport and Exercise*, 19,1-9. <https://doi.org/10.1016/j.psychsport.2015.02.003>
- Besharat, M. & Pourbohloul, S. (2011). Moderating Effects of Self-Confidence and Sport Self-Efficacy on the Relationship between Competitive Anxiety and Sport Performance. *Psychology*, 2, 760-765. doi: 10.4236/psych.2011.27116.
- Brown, D.J., & Fletcher, D. (2017). Effects of Psychological Psychological interventions on Sports Performance: A Meta –Analysis. *Sports Medicine*. 47(1), 77-99.
- Criticos, M., Layne, T., Simonton, K., & Irwin, C. (2020). Gender differences with anxiety, perceived competence, and grit in collegiate track and field throwers. *Journal of Physical Education and Sport*, 20(5), Article 374. <https://doi.org/10.7752/jpes.2020.05374>
- Church, H.R., Rumbold, J.L., & Sandars, J. (2017). Applying sports psychology to improve clinical performance. *Medical Teacher*, 39(12), 1205-1213. <https://doi.org/10.1080/0142159X.2017.1359523>
- Ciaccio J. B. (2019). Should We Give a Grit About Movement? Examining the Relationships Among Mindset, Grit, Self-Efficacy, and Exercise Behavior. (Doctoral thesis), Temple University Graduate Board, Philadelphia, PA.
- Cormier, D.L., Ferguson, L.J., Gyurcsik, N.C., et al., (2021). Grit in sport: a scoping review. *International Review of Sport and Exercise Psychology*, <https://doi.org/10.1080/1750984X.2021.1934887>
- DeCouto, B., Cowan, R. L., Fawver, B., Lohse, K. R., Podlog, L., & Williams, M. (2019). Psychological characteristics associated with performance and injury outcomes in adolescent alpine skiers. *North American Society for the Psychology of Sport and Physical Activity*, 41(Suppl. 1), S61. <https://doi.org/10.1123/jsep.2019-0082>
- De La Cruz, M., Zarate, A., Zamarripa, J., Castillo, I., Borbon, A., et al., (2021) Grit, Self-Efficacy, Motivation and the Readiness to Change Index Toward Exercise in the Adult Population. *Frontiers in Psychology*, 12, <https://doi.org/10.3389/fpsyg.2021.732325>
- DeCaro, M. S., Thomas, R. D., Albert, N. B., and Beilock, S. (2011). Choking under pressure: multiple routes to skill failure. *J. Exp. Psychol. Gen.* 140, 390–406. doi: 10.1037/a0023466
- Doorley, J. D. (2020). Exploring self-compassion, positive and negative emotion regulation, sport performance, and daily resilience among college athletes (Publication No. 27995803) [Doctoral dissertation]. George Mason University. ProQuest Dissertations and Theses Global.
- Duckworth, A.L., Peterson, C., Matthews, M.D., & Kelly, D.R. (2007). Grit: perseverance and passion for long term goals. *Journal of Personality and Social Psychology*, 92,1087-1101.<https://doi.org/10.1037/0022-3514.92.6.1087>
- Duckworth, A. L. (2013). NGrit: The Power of Passion and Perseverance. [Video File]. Available online at [https://www.ted.com/talks/angela\\_lee\\_duckworth\\_grit\\_the\\_power\\_of\\_passion\\_and\\_perseverance](https://www.ted.com/talks/angela_lee_duckworth_grit_the_power_of_passion_and_perseverance)
- Durović, D., Popov, S., Soki, J., Gruji, S., & Veljković, A. A. (2021). Rethinking the role of anxiety and self-efficacy in collective sports achievements. *Primenjena Psihologija*, 14(1), 103–115. <https://doi.org/10.19090/pp.2021.1.103-115>
- Elliot, P. J. (2018). Examining the correlation between psychological grit and athletic performance among NCAA men's basketball student-athletes (Publication No. 10822261) [Doctoral dissertation]. Grand Canyon University. ProQuest Dissertations and Theses Global.
- Ericsson A. (2009). Development of Professional Expertise: Toward Measurement of Expert Performance and Design of Optimal Learning Environments. New York: Cambridge University Press; 10.1017/CBO9780511609817

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American Psychologist*, 34 (10), 906–911. <https://doi.org/10.1037/0003-066X.34.10.906>

Fawver, B., Cowan, R. L., DeCouto, B., Lohse, K. R., Podlog, L., & Williams, A. M. (2020). Psychological characteristics, sport engagement, and performance in alpine skiers. *Psychology of Sport and Exercise*, 47, Article 101616. <https://doi.org/10.1016/j.psychsport.2019.101616>

Grix, J., Brannagan, P. M., Grimes, H., & Neville, R. (2021). The impact of Covid-19 on sport. *International Journal of Sport Policy and Politics*, 13(1). <https://doi.org/10.1080/19406940.2020.1851285>

Jan, B., Horodyska, K., & Zarychta, K. (2015). Intrinsic Motivation Predicting Performance Satisfaction in Athletes: Further Psychometric Evaluations of the Sport Motivation Scale-6. *Polish Psychological Bulletin*, 46(2),309-319. <http://dx.doi.org/10.1515/ppb-2015-0037>

Kirschen, G. W., Jones, J. J., & Hale, L. (2020). The Impact of Sleep Duration on Performance Among Competitive Athletes: A Systematic Literature Review. *Clinical Journal of Sport Medicine: Official Journal of the Canadian Academy of Sport Medicine*, 30(5). <https://doi.org/10.1097/JSM.0000000000000622>

Love, S., Kannis-Dymand, L., & Lovell, G.P. (2018). Metacognitions in Triathletes: Associations with Attention, State Anxiety, and Relative Performance. *Journal of Applied Social Psychology*, 30(4),421-436. <https://doi.org/10.1080/10413200.2018.1440660>

Lonel, M.S., Ion, A., & Visu-Petra, L. (2022). Personality, grit, and performance in rock-climbing: down to the nitty-gritty. *International Journal of Sport and Exercise Psychology*, <https://doi.org/10.1080/1612197X.2022.2044368>.

Love, S., Kannis- Dymand, L., & Lovell, G.P. (2021). Sports-specific metacognitions: associations with flow state in triathletes. *Australian Journal of Psychology*, 73(2),167-178. <https://doi.org/10.1080/00049530.2021.1882267>

MacIntyre, T., and Moran, A. (2007b). Exploring imagery use and meta-imagery processes: qualitative investigations with an elite multi-sport sample. *J. Imagery Res. Sport Phys. Act.* 2:4.

MacIntyre, T., and Moran, A. P. (2010). “Meta-imagery processes among elite sports performers,” in *The Neurophysiological Foundations of Mental and Motor Imagery*, eds A. Guillot and C. Collet (Oxford: Oxford University Press), 227–244. doi: 10.1093/acprof:oso/9780199546251.003.0016

MacIntyre, T.W., Moran, A.P., Collet, C., & Guillot, A. (2013) An emerging paradigm: a strength-based approach to exploring mental imagery. *Frontiers in human neuroscience*, 7,104. <https://doi.org/10.3389/fnhum.2013.00104>

MacIntyre, T. E., Igou, E. R., Campbell, M. J., Moran, A. P., & Matthews, J. (2014). Metacognition and action: a new pathway to understanding social and cognitive aspects of expertise in sport. *Frontiers in psychology*, 5, 1155. <https://doi.org/10.3389/fpsyg.2014.01155>

Moles, T.A., Auerbach, A.D., & Petrie, T.A. (2017). Grit Happens: Moderating Effects on Motivational Feedback and Sport Performance. *International Journal of Applied Sport Psychology*, 29(4). <https://doi.org/10.1080/10413200.2017.1306729>

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009a). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7), e1000097.

Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research Quarterly for Exercise and Sport*, 71(3), 280–294. <https://doi.org/10.1080/02701367.2000.10608908>

Moran, A. P. (1996). *The psychology of concentration in sport performers*. Psychology Press.

Moran, A. P. (2011). Attention. In D. Collins, A. Button, & H. Richards (Eds.), *Performance psychology: A practitioner’s guide* (pp. 319–335). Elsevier. <https://doi.org/10.1016/B978-0-443-06734-1.00022-5>

Nietfield, J. L. (2003). An Examination of Metacognitive Strategy Use and Monitoring Skills by Competitive Middle Distance Runners. *Journal of Applied Sport Psychology*, 15, 307–320. <https://doi.org/10.1080/714044199>

Oliver, A., McCarthy, P.J., Burns, L. (2021). Using a “Think Aloud” protocol to understand meta-attention in club-level golfers, *International Journal of Sport and Exercise Psychology*, 19(5). <https://doi.org/10.1080/1612197X.2020.1766536>

Romero, M. T. O., Garrido Guzmán, M. E., & Vázquez, C. C. (2022). Self-efficacy and resilience: differences between fitness/bodybuilding athletes and non-athletes. *Retos*, 44, 232–241. <https://doi.org/10.47197/RETOS.V44I0.88937>

Rogowska, A. M., Tataruch, R., Niedźwiecki, K., & Wojciechowska-Maszkowska, B. (2022). The Mediating Role of Self-Efficacy in the Relationship between Approach Motivational System and Sports Success among Elite Speed Skating Athletes and Physical Education Students. *International Journal of Environmental Research and Public Health*, 19(5).

<https://doi.org/10.3390/ijerph19052899>

Schunk, D.H. (2008). Self-efficacy, motivation, and performance. *Journal of Applied Sport Psychology*, 7(2)112-137. <https://doi.org/10.1080/10413209508406961>

Shaver, N. T. (2017). Improving baseball hitting skills: Video feedback, psychomotor learning theory, and individual differences (Publication No. 10758816) [Doctoral dissertation]. New Mexico State University. ProQuest Dissertations and Theses Global.

Sivrikaya, M. (2019). The role of Self-efficacy on Performance of Sports Skills of Football Players. *Journal of Education and Training Studies*, 6(75). <http://dx.doi.org/10.11114/jets.v6i12a.3952>

Tarricone, P. (2011). *The Taxonomy of Metacognition* (1st ed.). Psychology Press. <https://doi.org/10.4324/9780203830529>

Wells, C.M., Collins, D., & Hale, B.D. (2007). The self-efficacy-performance link in maximum strength performance. *Journal of Sport Sciences*, 11(2)167-175. <https://doi.org/10.1080/02640419308729980>

Wright, B.J., O'Halloran, P.D., & Stukas, A.A. (2015). Enhancing Self-Efficacy and Performance: An Experimental Comparison of Psychological Techniques. *Research Quarterly for Exercise and Sport*, 87(1), 36-46. <https://doi.org/10.1080/02701367.2015.1093072>

What makes Neeraj Chopra so good? (2021, August 14) Athleticism, thought process, sprinting speed. ESPN. Retrieved July 7, 2022, from [https://www.espn.in/athletics/story/\\_/id/32019117/what-makes-neeraj-chopra-good-athleticism-thought-process-sprinting-speed](https://www.espn.in/athletics/story/_/id/32019117/what-makes-neeraj-chopra-good-athleticism-thought-process-sprinting-speed)

Weinberg R. S. (1994). Goal setting and performance in sport and exercise settings: a synthesis and critique. *Medicine and science in sports and exercise*, 26(4), 469–477.

Goal setting and performance in sport and exercise settings: a synthesis and critique - PubMed (nih.gov)

