

Passion and grit in individuals with high levels of growth mindset are different than in individuals who have low growth mindset

Hermundur Sigmundsson^{a,b,*}, Monika Haga^c

^a Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway

^b Research Center for Education and Mindset, University of Iceland, Iceland

^c Department of Teacher Education, Norwegian University of Science and Technology, Trondheim, Norway

ARTICLE INFO

Keywords:

Passion
Grit
Mindset
Achievement
Performance
Learning
Well-being

ABSTRACT

The main aim of the study was to investigate whether passion and grit varied in individuals with distinct levels of growth mindset. From an original sample of 1548 participants in the age 13 to 77 years, two groups with the 5 % highest scoring and the 5 % lowest scoring on growth mindset, respectively, were compared on their scores in passion and grit. Participants completed as a measure of Mindset the Theories of intelligence Scale (TIS). Grit-S scale was used to assess grit and to assess passion the eight item Passion Scale was used.

Findings displayed that the growth mindset group with low scoring had significantly lower score in passion and grit than the growth mindset group with high scoring, indicating that adults with low growth mindset shows lower levels of passion and grit related to their peers with a high-level score.

These results may probable be significant for better understanding of the relationship between these constructs positively related to life satisfaction, well-being, achievement, and learning. Additionally, acquiring a better picture of what indicate individuals with different levels of growth mindset can increase our comprehension of how to increase motivation, pursue long-term goals and maintain effort in different groups. It can be argued that growth mindset should be all encompassing in our society. Both in schools, sports, working life and within the walls of the family.

1. Introduction

A useful approach to understanding how individuals face challenges, pursue long-term goals, and maintain effort in school and life is to explore the factors of passion, grit, and growth mindset. There has been a growing interest in research associated to these factors in the scientific community, as they appear to be central to high achievement and excellence (Alan et al., 2019; Duckworth, 2016; Dweck, 2017; Ericsson et al., 2007; Ericsson & Pool, 2016; Sigmundsson, 2024; Sigmundsson et al., 2017, 2022; Vallerand, 2010; Sigmundsson, Clemente, & Lof-tesnes, 2020; Yeager et al., 2019). Mindsets is the collection of thoughts and beliefs in our own traits, such as personality or intelligence (Dweck, 2012). While individuals with a fixed mindset tend to consider that human attributes are fixed and permanent qualities, individuals with a growth mindset assume that intellectual ability is malleable rather than fixed and that intelligence can be significantly enhanced through effort, rehearsal, effective learning strategies and education (Dweck, 2000, 2008; Dweck & Leggett, 1988). Mindset impacts to adaptive cognitive

and behavioral outcomes (Park et al., 2020), and research has revealed solid evidence of the influence of growth mindset for success in play and work (see for example Dweck, 2017). Moreover, growth mindset, grit and passion are found to be factors that are central to become successful in sports (Albert et al., 2021; Shamsirian et al., 2021; Sigmundsson, 2024; Sigmundsson, Clemente, & Lof-tesnes, 2020; Vallerand & Verner-Filion, 2020). The concept of passion can be traced all the way back to Greek philosophers, including Plato (428–348 B.C.E.). Later, Hegel (1770–1831) stated that passion is needed for reaching the highest level of achievement (Vallerand, 2016). Passion is characterized as a strong desire or enthusiasm for something (Oxford University Press, 2019), or a strong feeling toward an important value/preference that motivates intentions and behaviors to express that value/preference (Jachimowicz et al., 2018). Grit is defined as perseverance and passion for long-term goals and is characterized by exertion or diligence and contributes to the maintenance of effort and interest although the failure of progress (Duckworth et al., 2007).

A recent longitudinal study of adolescents reveals that grit and

* Corresponding author at: Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway.

E-mail address: hermundur.sigmundsson@ntnu.no (H. Sigmundsson).

growth mindset equally predicted each other's development; that is, the two attributes seem to mutually reinforce each other (Park et al., 2020). A strong association is found between grit and conscientiousness ($r = 0.77$), one of the five personality traits of the Big Five personality theory (Duckworth et al., 2007) and even stronger association to the facet "self-discipline" ($r = 0.92$) (Schmidt et al., 2018). Growth mindset and passion are found to correlate significant in a sample of 917 participants between 14 and 77 years ($r = 0.166, p < .001$). However, the association varied between age groups and was not significant in the oldest age group (37–77 years) (Sigmundsson, 2021). Passion and grit can be seen as entwined constructs that are both required for high attainment and performance. However, while grit captures perseverance, individuals' levels of passion is describing involvement, commitment, and effort (Sigmundsson, Haga, & Hermundsdottir, 2020a). Passion, defined as having a strong interest in certain areas, however, has proven to be a key element to good results in various activities (Mageau et al., 2009; Sigmundsson et al., 2022; Sigmundsson, Clemente, & Loftesnes, 2020).

Research have found a significant gender difference when assessing passion levels, as males had significantly higher scores on the Passion Scale compared to women. This can mean that passion affects the behavior of males differently than in females, or vice versa, behavior influences passion levels in male's otherwise than in females (Sigmundsson, 2021; Sigmundsson, Haga, & Hermundsdottir, 2020b). This may be related to different dopamine activity in female and males (Soutschek et al., 2017). Dopamine is thought to play a key role in neural reward processing (Schultz, 2007, 2015). Females show more dopamine activity related to prosocial reward/behavior (generous, altruistic, inequality averse) while male show more activity related to self-reward/selfish reward/behavior (Soutschek et al., 2017). Dopamine blockades decrease generosity in female but increase generosity in males (Soutschek et al., 2017). Soutschek et al. (2017, p. 824) argue that the observed effects may not be 'an expression of hard-wired differences between men and women per se, but rather that education and learning history may be the driving factors for differential associations of high reward value to different behaviors by the dopaminergic reward system'. Research indicate also that females are more risk averse than males. In addition males tend to 'view risky situations as challenges, as opposed to threats...' (Croson & Gneezy, 2009, p. 454).

Research about gender differences in grit are scarce and conflicting, some reports higher scorings in females compared to males (Christensen & Knezek, 2014; Kannangara et al., 2018) while other find no such gender differences (Sigmundsson, Haga, & Hermundsdottir, 2020a, b). Nor have the limited research on gender differences in growth mindset revealed such differences (de Kraker-Pauw et al., 2020; Sigmundsson, Haga, & Hermundsdottir, 2020a, b; Sigmundsson, Clemente, & Loftesnes, 2020). Moreover, it is revealed a core difference between the interaction of these three factors between the sexes (Sigmundsson, Haga, & Hermundsdottir, 2020b). In males, a strong association between passion and grit is found, possible indicating that to use energy and willpower on something, a strong interest must also be present. In females, on the other hand, there are high associations between grit and growth mindset (Sigmundsson, Haga, & Hermundsdottir, 2020b).

The development of positive attributes such as passion, grit, and growth mindset are important for development of skills and knowledge throughout life, however, research on the associations between these significant non-cognitive factors has been rather scarce (Sigmundsson, Haga, & Hermundsdottir, 2020a, b). Not least is it of interest to explore how grit and passion in individuals with low growth mindset differs from those with a high growth mindset. Mindsets are of particular interest as it is found to be improved with interventions (Paunesku et al., 2015; Yeager et al., 2019), thus, exploring the extremes of the distribution in mindset can provide a clearer picture of what characterize individuals with different mindset and improve our understanding of how to enhance motivation, pursue long-term goals and maintain effort in different groups. Therefore, this paper sought out to investigate passion and grit in individuals with high and low growth mindset,

respectively. One group consisting of the subjects with the 5 % highest scores on the growth mindset scale, which are referred to as the growth mindset high group (GMH group), and another group with the 5 % lowest scores on the growth mindset scale termed the growth mindset low group (GML group).

2. Method

2.1. Participants

A sample of 1548 participants from 13 to 77 years completing the measurements of passion, grit and mindset. The mean age for the whole sample was 26.51 years (SD 11.77). The average age for the female sample ($N = 931$) was 26.68 (SD 11.81), and the male sample ($N = 617$) was 26.27 (SD 11.71). Two hundred and forty-two adolescents (13 to 19 years old) were randomly enrolled from mainstream secondary- and high schools. The sample reflected the adolescent population attending schools in this region and consisted of participants from a wide range of socio-economic backgrounds. Adult participants ($N = 1326$), ranging from 20 to 77 years, were randomly selected from a university student population, sports clubs, and visitors to a public building. Two groups were selected from this initial sample, one group scoring high (GMH group) and other group scoring low (GML group) on the growth mindset scale. The GMH group consisted of 78 participants (49 females and 29 males) with the 5 % highest score on the growth mindset scale, with a mean score of 5.96 (SD 0.059). The GML group consisted of 78 participants (34 female and 44 males) with the 5 % lowest scores on the growth mindset scale with a mean score of 1.43 (SD 0.50). The average age in the GMH group was 31.29 years (SD 12.22), and 27.32 years (SD 13.03) in the GML group.

2.2. Measurements

2.2.1. Passion

The passion scale was used to test the participants passion for achievement (Sigmundsson, Haga, & Hermundsdottir, 2020a; Norwegian version, Sigmundsson, Clemente, & Loftesnes, 2020). The scale has eight items on a scale from 1 (not like me at all) to 5 (very much like me). For the whole scale the total score ranged between 1 (not at all passionate) and 5 (extremely passionate). The scale has shown good internal consistency (Cronbach's alpha value 0.86) and high levels of test-retest reliability. Between test and retest total scores the intra-class correlation coefficient (ICC) was 0.92 ($N = 21$, mean age 23.67, SD = 2.41). Construct validity: Pearson correlation coefficient between total score Passion and Grit S Scale were .39 for adults (mean age 21.23, SD = 3.45) ($N = 107$) (Sigmundsson, Haga, & Hermundsdottir, 2020a). The Chronbach's alpha value for this study was 0.92, indicating a high internal consistency.

2.2.2. Grit

To measure the level of grit the Grit S Scale was used (Duckworth & Quinn's, 2009, Norwegian version, Sending, 2014). It has two dimensions; Consistency of Interest (COI) (e.g., 'I often set a goal but later choose to pursue a different one' (reverse-scored)) and Perseverance of Effort (POE) (e.g., 'I finish whatever I begin'). The eight items were measured on a 5-point Likert scale wherein 1 would mean 'not like me at all' and 5 would mean 'very much like me'. The total score range between 1 (not at all gritty) and 5 (extremely gritty). The scale has shown good internal consistency $\alpha = 0.82$ and $\alpha = 0.84$ (in several studies) (Duckworth & Quinn, 2009, p.170), and the results support test-retest stability, predictive validity and consensual validity of the Grit-S. The Chronbach's alpha value for this study was 0.73, indicating a good internal consistency.

2.2.3. Mindset

To measure participants mindset a Norwegian version of Dweck's

(1999) Theories of Intelligence Scale (TIS) was used; Norwegian version (Bråten & Strømsø, 2004). Participants signaled their agreement or disagreement using a 6-point scale (1 = strongly agree to 6 = strongly disagree) on a variety of items related to the malleability and stability of intelligence and talent. TIS contains of two subscales, and items were represented so that agreement revealed either support for an entity theory, i.e., fixed mindset (e.g., You have a certain amount of intelligence, and you can't really do much to change it) or an incremental theory, i.e., a growth mindset (e.g., No matter who you are, you can significantly change your intelligence level). The incremental scale items were reversed, i.e., higher average scores indicate higher incremental beliefs about intelligence (growth mindset) before summing the items. The reliability data for the scale is based on Dweck et al. (1995), and the scale proved good internal consistency ($\alpha = 0.85$) and test-retest reliability at 2-weeks ($r = 0.80$). TIS scale indicated good construct validity with scores predicting meaningful relationship with several variables (Dweck et al., 1995). TIS Norwegian version has been found to be reliable, with Cronbach's α of 0.88 for the incremental items and 0.86 for the entity items (Bråten & Strømsø, 2004). The Chronbach's alpha value for this study was 0.93, indicating a high internal consistency.

2.3. Procedure

The study was conducted in agreement with the guidelines set out by the Norwegian Centre for Research Data. Participants and their parents or guardians in the adolescent's group (i.e., younger than 16 years), were given written information about the study before the data collection. Written permission was obtained from parents or guardians before involvement in the study, for the adolescent group. Passive consent was sufficient for participants older than 16 years, as no sensitive personal data were collected according to the Norwegian Centre for Research Data. Adolescents and university students were assessed at the school campus. The questionnaire was completed in a quiet room, and a trained experimenter explained the procedure and was present when the questionnaires were answered.

2.4. Data reduction and analysis

SPSS Version 25 for Windows was used for the statistical analysis (SPSS Inc., Chicago, IL, USA). *t*-Test was used to analyze the differences between groups.

3. Results

For the whole group ($N = 1548$) the correlation between passion and grit was $r = 0.330$. Between passion and mindset the correlation was $r = 0.158$, and between grit and mindset the correlation was $r = 0.177$. The correlation was significant ($p < .01$).

Total score passion for the GMH group ($M = 4.14$, $SD = 0.65$) was significantly higher than for the GML group ($M = 3.78$, $SD = 0.76$) ($t(154) = 3.1793$, $p = .002$). Total score grit for the GMH group ($M = 3.61$, $SD = 0.62$) was also significantly higher than for the GML group ($M = 3.23$, $SD = 0.74$) ($t(154) = 3.4763$, $p < .001$) (see Table 1 and Fig. 1).

Table 1

Mean score and SD for passion total and grit total for the two groups Growth Mindset High and Growth Mindset Low.

Groups	Growth mindset high group ($N = 78$)	Growth mindset low group ($N = 78$)	Cohen's <i>d</i>	<i>p</i>
	Mean (SD)	Mean (SD)		
Age (years)	31.29 (12.22)	27.32 (13.03)		
Passion	4.14 (0.65)	3.78 (0.76)	0.71	0.002
Grit	3.61 (0.62)	3.23 (0.74)	0.68	<0.001

4. Discussion

This paper sought to explore levels of passion and grit in individuals with high and low growth mindset, respectively. The results indicated significant difference between the two groups (GMH and GML), that is, the group of GMH scored significantly higher in both passion and grit measures compared to the group of GML.

A significant difference between the groups in grit score ($M = 3.61$ vs. $M = 3.23$) supports the argument put forward by Duckworth (2016) and Dweck (2017), that growth mindset is a potential underlying factor for grit. Indeed, individual's belief about the malleability of personal attributes and abilities affects an individual's behavior in terms of goals and actions. However, the opposite might also be true. As recently shown by Park et al. (2020), growth mindset and grit seem to be attributes whose development are reciprocally reinforcing. Their study suggests that during adolescence, grit and growth mindset are distinct but mutually influencing each other across time (Park et al., 2020). In other words, a growth mindset, characterized by a confidence in own intellectual ability, influence your actions, but past successful behavior/actions may possibly have led to those adaptive beliefs in your ability in the first place (Park et al., 2020, p 8). The reciprocal correlation between grit and growth mindset is also supported by the study of Alan et al. (2019), finding that grit is malleable in the childhood period (9–10 years old) and can be fostered in the classroom environment through targeted education with a focus on strengthening growth mindset. Moreover, interventional approaches are found to develop growth mindset, and even a short online growth mindset intervention improves grades among lower-achieving students (Yeager et al., 2019).

The difference in passion score between the groups GMH and GML ($M = 4.14$ vs. $M = 3.78$) indicates that displaying high growth mindset is also related with higher levels of passion. This may suggest that growth mindset is intertwined with passion, and that passion could be an additional factor of importance for performance and achievement (Dweck, 2017; Sigmundsson & Haga, 2020; Sigmundsson, Haga, & Hermundsdottir, 2020a). The results are also supported by the significant correlation between passion and mindset for a group of students ($r = 0.260$, $N = 146$, mean age 22.01), this was true for both females ($r = 0.299$) and males ($r = 0.260$) (Sigmundsson, Haga, & Hermundsdottir, 2020b). It can be argued that growth mindset may be an underlying factor for both passion and grit. Passion represents long term interest, enthusiasm, and involvement with something or someone specific (Jachimowicz et al., 2018; Sigmundsson, Haga, & Hermundsdottir, 2020a), and a growth mindset can influence behaviors when it comes to preserving and reinforcing this particular interest and enthusiasm over time. However, it could also be a reciprocal association between growth mindset and passion; high levels of passion could promote perseverance, focus and effort in deliberate practice (Vallerand et al., 2008; Vallerand & Vermer-Filion, 2020). Thus, individuals with high passion are highly motivated to apply time and effort in an activity, and thereby improve skills/competence and experience mastery. Also, individuals that are passionate with something could display more stamina when facing challenges and difficulties. In this context, individuals experience the malleability of ability which again further cultivate one's passion, emphasizing the possible mutual reinforcement of the two attributes.

4.1. Strengths and limitations

The current study investigated factors that are critical for high attainment and performance through various age-groups. The findings shed new light on the relationships between mindset, grit and passion and provide a basis for further research. The applied instruments for assessing the variables are found to have adequate psychometric properties and contains both positively and negatively formulated items to reduce acquiescent bias. The sample size is large, and participants were recruited from different age groups. The cross-sectional research allows to explore differences between the groups on passion and grit levels,

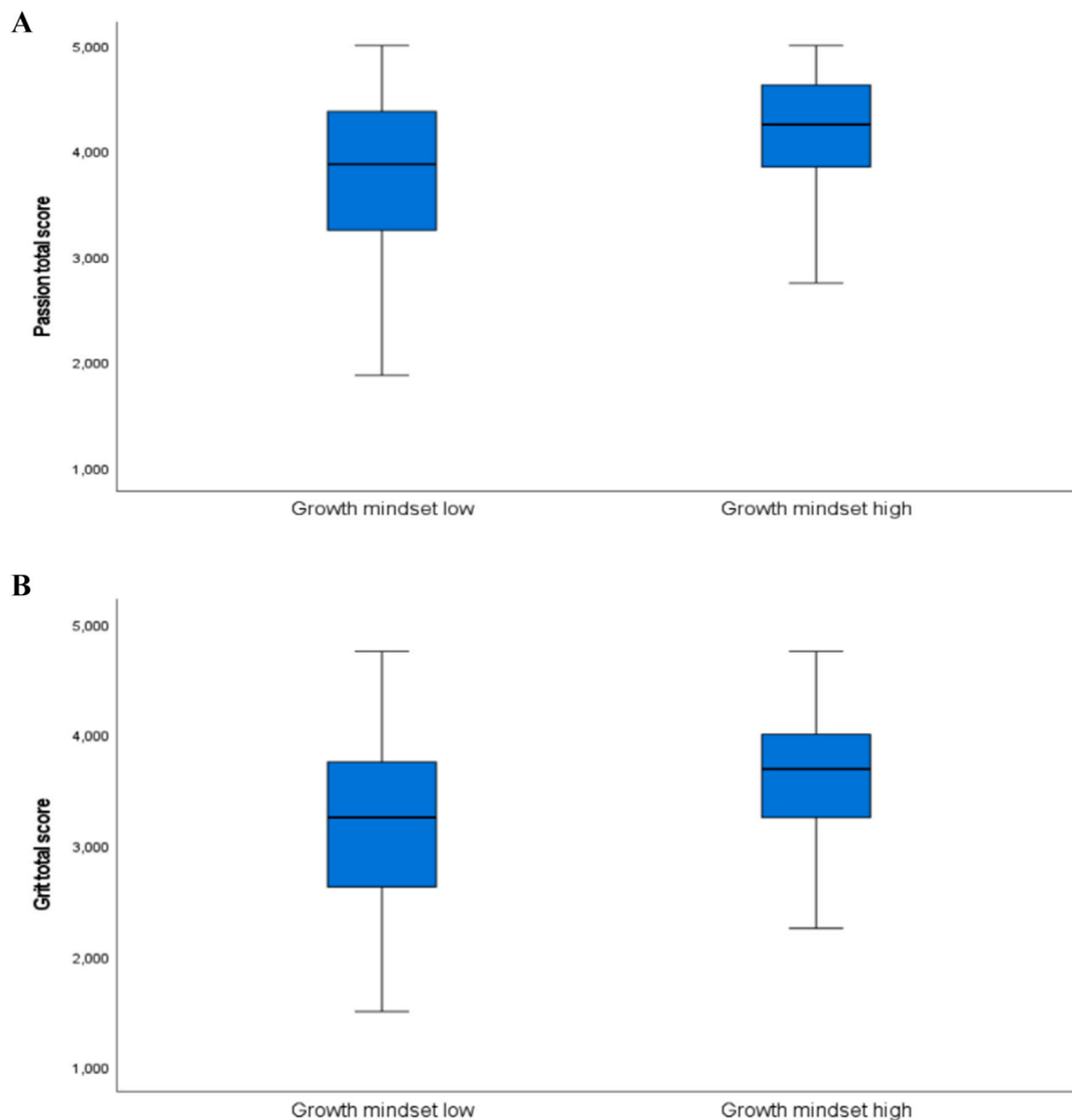


Fig. 1. Box plots depicting the GMH group ($n = 78$) and GML group ($n = 78$) performance on (A) Passion ($t(154) = 3.1793, p = .002$). (B) Grit ($t(154) = p < .001$). Horizontal lines within boxes represent the group medians. Box edges define the first and third quartiles, whiskers define the 10th and 90th percentile.

however, we do not know the practical value, that is if the two groups differed in outcomes such as better grades in core subjects or higher achievement in various activities/domains. In the current study, grit, mindset, and passion were not measured in relation to specific domains but more generally. Findings could have been different if all three attributes were measured at the same level of specificity (e.g., sport). Moreover, the cross-sectional design does not allow to determine causal direction among the variables. Participants were recruited from the Nordic region, and we do therefore not know whether the findings can be generalized to other countries and regions. Like all questionnaire-based surveys, this study might be subject to possible self-reporting bias.

5. Conclusion

The study found a difference between the two groups with high and low levels of growth mindset, respectively, when comparing levels of passion and grit. This shows the significance of growth mindset for passion and grit or vice versa. This elucidates the importance of a comprehensive understanding of the path to improved performances and expertise. Thus, growth mindset may be an important asset to promote and strive for both in the everyday life in school, sports,

working life and at home during the whole life span.

CRediT authorship contribution statement

Hermundur Sigmundsson: Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Monika Haga:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

References

- Alan, S., Boneva, T., & Ertac, S. (2019). Ever failed, try again, succeed better: Results from a randomized educational intervention on grit. *The Quarterly Journal of Economics*, 134(3), 1121–1162.
- 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*, 1–14.
- Bråten, I., & Stromso, H. I. (2004). Epistemological beliefs and implicit theories of intelligence as predictors of achievement goals. *Contemporary Educational Psychology*, 29(4), 371–388. <https://doi.org/10.1016/j.cedpsych.2003.10.001>
- Christensen, R., & Knezek, G. (2014). Comparative measures of grit, tenacity and perseverance. *International Journal of Learning, Teaching and Educational Research*, 8(1), 16–30.
- Crosen, R., & Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic Literature*, 47(2), 448–474.
- de Kraker-Pauw, E., van Wesel, F., Krabbendam, L., & van Atteveldt, N. (2020). Students' beliefs about the nature of intelligence (mindset). *Journal of Adolescent Research*, 0743558420967113.
- Duckworth, A. (2016). *Grit. The power of passion and perseverance*. Scribner Book Company.
- 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., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit-S). *Journal of Personality Assessment*, 91, 166–174. <https://doi.org/10.1080/00223890802634290>
- Dweck, C. S. (1999). *Self-theories. Their role in motivation, personality, and development*. Philadelphia: Psychology Press.
- Dweck, C. S. (2000). *Self-theories: Their role in motivation, personality, and development*. Psychology Press.
- Dweck, C. S. (2008). Can personality be changed? The role of beliefs in personality and change. *Current Directions in Psychological Science*, 17(6), 391–394.
- Dweck, C. S. (2012). Mindsets and human nature: Promoting change in the Middle East, the schoolyard, the racial divide, and willpower. *American Psychologist*, 67(8), 614–622. <https://doi.org/10.1037/a0029783>
- Dweck, C. S. (2017). *Mindset. Changing the way you think to fulfil your potential*. Little, Brown Book Group.
- Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry*, 6(4), 267–285. https://doi.org/10.1207/s15327965pli0604_1
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256.
- Ericsson, K. A., & Pool, R. (2016). *Peak: Secrets from the new science of expertise*. New York: Houghton Mifflin Harcourt.
- Ericsson, K. A., Prietula, M. J., & Cokely, E. T. (2007). The making of an expert. *Harvard Business Review*, 115–121.
- Jachimowicz, J. M., Wihler, A., Bailey, E. R., & Galinsky, A. D. (2018). Why grit requires perseverance and passion to positively predict performance. *Proceedings of the National Academy of Sciences*, 115, 9980–9985.
- Kannangara, C. S., Allen, R. E., Waugh, G., Nahar, N., Khan, S. Z. N., Rogerson, S., & Carson, J. (2018). All that glitters is not grit: Three studies of grit in university students. *Frontiers in Psychology*, 9, 1539.
- Mageau, G. A., Vallerand, R. J., Charest, J., Salvu, S., Lacaille, N., Bouffard, T., et al. (2009). On the development of harmonious and obsessive passion: The role of autonomy support, activity valuation, and identity processes. *Journal of Personality*, 77, 601–645.
- Oxford University Press. (2019). <https://en.oxforddictionaries.com/definition/passion> (2019).
- Park, D., Tsukayama, E., Yu, A., & Duckworth, A. L. (2020). The development of grit and growth mindset during adolescence. *Journal of Experimental Child Psychology*, 198, Article 104889.
- Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-set interventions are a scalable treatment for academic underachievement. *Psychology Science*, 26(6), 784–793. <https://doi.org/10.1177/0956797615571017>
- Schmidt, F. T. C., Nagy, G., Fleckenstein, J., Möller, J., & Retelsdorf, J. (2018). Same same, but different? Relations between facets of conscientiousness and grit. In *European Journal of Personality*Wiley Online Library.
- Schultz, W. (2007). Multiple dopamine functions at different time courses. *Annual Review of Neuroscience*, 30(259–288), 8.
- Schultz, W. (2015). Neuronal reward and decision signals: From theories to data. *Physiological Reviews*, 95, 853–951.
- Sending, V. (2014). *Thinking success, behaving successfully: The relation between hypothetical thinking strategies, effort towards goal attainment and grit (Master's thesis)*. Tromsø: University of Tromsø, The Arctic University.
- Shamshirian, S., Halldorsson, V., & Sigmundsson, H. (2021). Passion, grit and mindset of Iranian wrestlers: A socio-psychological approach. *New Ideas in Psychology*, 62. <https://doi.org/10.1016/j.newideapsych.2021.100871>
- Sigmundsson, H. (2021). Passion, grit, and mindset in the ages 14 to 77: Exploring relationship and gender differences. *New Ideas in Psychology*, 60, Article 100815. <https://doi.org/10.1016/j.newideapsych.2020.100815>
- Sigmundsson, H. (2024). *How we learn and become experts. Igniting the spark*. Springer Nature.
- Sigmundsson, H., Clemente, F. M., & Loftesnes, J. M. (2020). Passion, grit and mindset in football players. *New Ideas in Psychology*, 59, Article 100797. <https://doi.org/10.1016/j.newideapsych.2020.100797>
- Sigmundsson, H., Dybendal, B. H., & Grassini, S. (2022). Motion, relation, and passion in brain physiological and cognitive aging. *Brain Sciences*, 12(9), 1122. <https://doi.org/10.3390/brainsci12091122>
- Sigmundsson, H., & Haga, M. (2020). Hvem blir eksperter? In H. Sigmundsson (Ed.), *Ekspertise. Utvikling av kunnskap og ferdigheter*. Oslo: Fagbokforlaget.
- Sigmundsson, H., Haga, M., & Hermundsdottir, F. (2020a). The Passion scale: Aspects of reliability and validity of a new 8-item scale assessing passion. *New Ideas in Psychology*, 56, Article 100745. <https://doi.org/10.1016/j.newideapsych.2019.06.001>
- Sigmundsson, H., Haga, M., & Hermundsdottir, F. (2020b). Passion, grit, and mindset in young adults: Exploring the relationship and gender differences. *New Ideas in Psychology*, 59, Article 100795. <https://doi.org/10.1016/j.newideapsych.2020.100795>
- Sigmundsson, H., Trana, L. M., Polman, R. C. J., & Haga, M. (2017). What is trained develops! Perspective on skill learning. *Sports*, 5(2), 38. <https://doi.org/10.3390/sports5020038>
- Soutschek, A., Burke, C. J., Raja Beharelle, A., Schreiber, R., Weber, S. C., Karipidis, I. I., ... Tobler, P. N. (2017). The dopaminergic reward system underpins gender differences in social preferences. *Nature Human Behaviour*, 1(11), 819–827.
- Vallerand, R. J. (2010). On passion for life activities: The dualistic model of passion. In M. P. Zanna (Ed.), *Vol. 42. Advances in experimental social psychology. Advances in experimental social psychology* (pp. 97–193). Academic Press. [https://doi.org/10.1016/S0065-2601\(10\)42003-](https://doi.org/10.1016/S0065-2601(10)42003-)
- Vallerand, R. J. (2016). The dualistic model of passion: Theory, research, and implications for the field of education. In W. C. Liu, J. C. K. Wang, & R. M. Ryan (Eds.), *Building autonomous learners* (pp. 31–58). Singapore: Springer. https://doi.org/10.1007/978-981-287-630-0_3
- Vallerand, R. J., Mageau, G. A., Elliot, A. J., Dumais, A., Demers, M. A., & Rousseau, F. (2008). Passion and performance attainment in sport. *Psychology of Sport and Exercise*, 9(3), 373–392.
- Vallerand, R. J., & Verner-Filion, J. (2020). Theory and research in passion for sport and exercise. In G. Tenenbaum, & R. C. Eklund (Eds.), *Handbook of sport psychology* (pp. 206–229). John Wiley & Sons, Inc. <https://doi.org/10.1002/9781119568124.ch11>
- Yeager, D. S., Hanselman, P., Walton, G. M., Murray, J. S., Crosnoe, R., Muller, C., Paunesku, D., et al. (2019). A national experiment reveals where a growth mindset improves achievement. *Nature*, 573(7774), 364–369.