Moving to Excellence: Embodiment in Gifted Education

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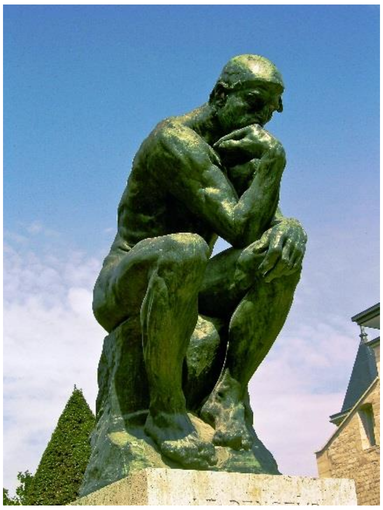
*"EXCELLENCE IS NOT A DESTINATION; IT IS A CONTINUOUS **JOURNEY** THAT NEVER ENDS." (BRIAN TRACY)*

A primary goal in education is the continuous optimization of teaching and learning processes. In order to find suitable approaches, it is necessary to gain insight into how such processes might function. Starting by reflecting on how our understanding of the world is shaped, one soon realizes that our entire perception is biased towards the fact that we are in a human body which in turn exists in a certain environment (Glenberg, Witt, & Metcalfe, 2013; Varela, Thompson, & Rosch, 2000). As a consequence for understanding the mind, Wilson (2002) concluded that it can only be comprehended in light of its relationships to a physical body which engages with its surrounding environment. Under the term *embodied cognition*, in



the past decades a whole area of research focusing on the interaction of the mind, the body, and the environment has evolved in cognitive science. As opposed to non-embodied approaches (Sun, 2008), it is assumed that cognitive processes and bodily cues are deeply rooted in each other (Dijkstra & Post, 2015; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; M. Wilson, 2002). This interplay can open up a number of possibilities for us due to the characteristics of our body and the environment, yet it also brings with it corresponding limits of action and sensation (Clark, Tremblay, & Ste-Marie, 2004; Shapiro, 2014; Varela et al., 2000). When viewing cognitive functioning as the interaction of a system of mind, body and environment, which consequences could arise for educational processes? Furthermore, with regard to the talented or gifted education in particular, what potential optimizations can the view of the body as an essential factor in the formation of cognition offer in the promotion of talent?

By assigning the body a crucial function in the learning process, this does not refer to the body as a mere tool, which executes commands from the brain as a central system and supports it in its cognitive performance. The role of the body might go much deeper: Research on embodied cognition points to positive effects of motor activity on learning processes, for example in mathematics, science, language and music. It is clear from these findings that learning cannot be regarded as a purely mental activity (Sullivan, 2018). Embodiment in learning processes can for instance be seen in the so-called *offloading* (Iverson & Goldin-Meadow, 1998; M. Wilson, 2002). By taking notes or putting information in gestures (like finger counting to understand numerical concepts, see for example Bahnmueller, Dresler, Ehlis, Cress, & Nuerk, 2014), certain cognitive information is transferred to the environment in order to create cognitive capacities in the working memory. In turn, more complex thinking processes are enabled (Ping & Goldin-Meadow, 2010; Pouw, Nooijer, van Gog, Zwaan, & Paas, 2014).

It was found that learners who use gestures when performing tasks are more likely to remember the content than learners who refrain from using gestures (Alibali, 2005; Alibali & Goldin-Meadow, 1993; Cook, Mitchell, & Goldin-Meadow, 2008; Ping & Goldin-Meadow, 2010; Pouw et al., 2014). Studies have shown individual differences in the gesture-effect on working memory. In this case—contrary to the famous Matthew effect ("the rich get richer and the poor get poorer", Gladwell, 2008)—particularly students with a rather weak working memory can benefit from the use of gestures in learning (Marstaller & Burianová, 2013). This could for example be beneficial for students who are identified as gifted with Attention Deficit Hyperactivity Disorder (Fugate, Zentall, & Gentry, 2013). Additionally, representative gestures in instructions appear to have positive effects on student's learning outcomes (Sullivan, 2018). As learners observe an action being performed, they mentally imitate it. This might allow the learning content to be retained and later retrieved more easily (Barchiesi & Cattaneo, 2015; Sullivan, 2018). These findings are suggested to be connected to *mirroring* effects in individuals, in which they subconsciously imitate nonverbal behaviors of others when perceiving their actions (Sullivan, 2018). Replication of the behavior of others, including facial expressions, gestures, posture, and so forth, may involve replication of a variety of other social parameters, such as the current mood of the person being mirrored (Chartrand & Bargh, 1999; La France, 1982), which might affect further factors important for successful learning, like motivation or social group integration.

Regarding action perception, literature reveals differences in the brain activation of experts compared to non-experts when observing actions in their field of expertise. For instance, fMRI studies with expert dancers have shown effects of their motor expertise on action perception (Calvo-Merino, Glaser, Grèzes, Passingham, & Haggard, 2005). It is suggested that the brain activation may be related to whether or not a subject can perform the observed action (Calvo-Merino et al., 2005). These effects due to simple observation could be applied in gifted education to further promote talent in the student's field of expertise. Moreover, gifted students with weak motor skills—as it might be the case in twice-exceptional students (i.e. students diagnosed as gifted in one or more areas as well as with having one or more disorders)—could receive support by training including the observation of action.

Further, the literature indicates that there is plenty of support for bodily effects on self-concept. For example, the effect of postures on an individual's mood and self-perception has previously been investigated. In this context, for instance, it was shown that individuals in upright postures demonstrate a more positive mood and increased confidence in their abilities (see for example Briñol, Petty, & Wagner, 2009; Canales, Cordás, Fiquer, Cavalcante, & Moreno, 2010; Carney, Cuddy, & Yap, 2015; Casasanto & Dijkstra, 2010; Dijkstra, Kaschak, & Zwaan, 2007; Michalak, Mischnat, & Teismann, 2014; Peper, Booiman, Lin, & Harvey, 2016; Peper, Lin, Harvey, & Perez, 2017; Thrasher, van der Zwaag, Bianchi-Berthouze, & Westerink, 2011; Tsai, Peper, & Lin, 2016; V. E. Wilson & Peper, 2004).

What possibilities may arise if, among one another, learners could reinforce positive attitudes toward themselves as well as the learning content? Particularly, the very diverse group of twice-exceptional students could benefit from these effects; by improving their areas of strength and additionally positively empowering their self-concept, the students may be enabled to compensate for their weaknesses (Baum & Owen, 2004; Ralabate, 2008, 2006). One asset of many

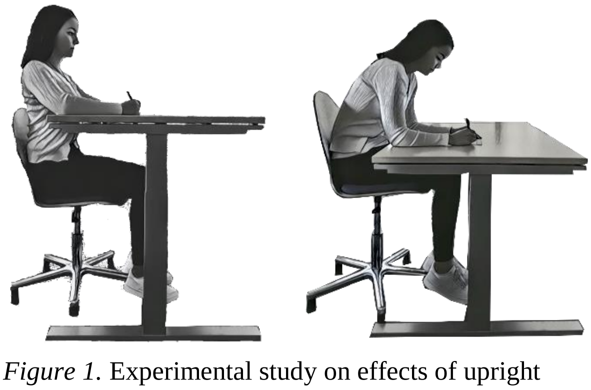


Figure 1. Experimental study on effects of upright compared to stooped postures (Awad, Debatin, & Ziegler, 2019).

highly able students is an exceptional creative performance. Various research findings suggest positive effects of embodiment on creative output. For example, there have been indications that individuals in open postures achieve more creative performance than individuals in closed postures (see for example Friedman & Förster, 2002; Hao, Xue, Yuan, Wang, & Runco, 2017). These findings could be used to further enhance creative behavior in gifted education.

Concluding, with regarding to the future conceptions and developments of gifted programs, the deep role of the body in cognitive processes may not be omitted rather it should be firmly integrated into the curricula. Insights into the talent and development of excellence in a wide variety of fields should therefore incorporate findings on embodiment effects in order to make the best possible use of bodily action to the promotion of talent.

References

Alibali, M. W. (2005). Gesture in Spatial Cognition: Expressing, Communicating, and Thinking About Spatial Information. *Spatial Cognition & Computation*, *5*(4), 307–331. https://doi.org/10.1207/s15427633scc0504_2

Alibali, M. W., & Goldin-Meadow, S. [S.] (1993). Gesture-Speech Mismatch and Mechanisms of Learning: What the Hands Reveal about a Child′s State of Mind. *Cognitive Psychology*, *25*(4), 468–523. https://doi.org/10.1006/cogp.1993.1012

Awad, S., Debatin, T., & Ziegler, A. (2019). Embodied Cognition: Effects of Postures on Mood and Cognitive Performance in Individual and Group Testing Sessions. *Manuscript submitted for publication.*

Bahnmueller, J., Dresler, T., Ehlis, A.‑C., Cress, U., & Nuerk, H.‑C. (2014). Nirs in motion-unraveling the neurocognitive underpinnings of embodied numerical cognition. *Frontiers in Psychology*, *5*, 743. https://doi.org/10.3389/fpsyg.2014.00743

Barchiesi, G., & Cattaneo, L. (2015). Motor resonance meets motor performance. *Neuropsychologia*, *69*, 93–104. https://doi.org/10.1016/j.neuropsychologia.2015.01.030

Baum, S. M., & Owen, S. V. (2004). *To be gifted & learning disabled: Strategies for helping bright students with learning & attention difficulties*. Mansfield Center, Conn.: Creative learning Press.

Briñol, P., Petty, R. E., & Wagner, B. (2009). Body posture effects on self-evaluation: A self-validation approach. *European Journal of Social Psychology*, *39*(6), 1053–1064. https://doi.org/10.1002/ejsp.607

Calvo-Merino, B., Glaser, D. E., Grèzes, J., Passingham, R. E., & Haggard, P. (2005). Action observation and acquired motor skills: An FMRI study with expert dancers. *Cerebral Cortex (New York, N.Y. : 1991)*, *15*(8), 1243–1249. https://doi.org/10.1093/cercor/bhi007

Canales, J. Z., Cordás, T. A., Fiquer, J. T., Cavalcante, A. F., & Moreno, R. A. (2010). Posture and body image in individuals with major depressive disorder: a controlled study. *Revista Brasileira de Psiquiatria*, *32*(4), 375–380. https://doi.org/10.1590/S1516-44462010000400010

Carney, D. R., Cuddy, A. J. C., & Yap, A. J. (2015). Review and Summary of Research on the Embodied Effects of Expansive (vs. Contractive) Nonverbal Displays. *Psychological Science*, *26*(5), 657–663. https://doi.org/10.1177/0956797614566855

Casasanto, D., & Dijkstra, K. (2010). Motor action and emotional memory. *Cognition*, *115*(1), 179–185. https://doi.org/10.1016/j.cognition.2009.11.002

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception–behavior link and social interaction. *Journal of Personality and Social Psychology*, *76*(6), 893–910. https://doi.org/10.1037/0022-3514.76.6.893

Clark, S., Tremblay, F., & Ste-Marie, D. (2004). Differential modulation of corticospinal excitability during observation, mental imagery and imitation of hand actions. *Neuropsychologia*, *42*(1), 105–112. https://doi.org/10.1016/S0028-3932(03)00144-1
Cook, S. W., Mitchell, Z., & Goldin-Meadow, S. [Susan] (2008). Gesturing makes learning last. *Cognition*, *106*(2), 1047–1058. https://doi.org/10.1016/j.cognition.2007.04.010
Dijkstra, K., Kaschak, M. P., & Zwaan, R. A. (2007). Body posture facilitates retrieval of autobiographical memories. *Cognition*, *102*(1), 139–149. https://doi.org/10.1016/j.cognition.2005.12.009
Dijkstra, K., & Post, L. (2015). Mechanisms of embodiment. *Frontiers in Psychology*, *6*, 1525. https://doi.org/10.3389/fpsyg.2015.01525
Friedman, R. S., & Förster, J. (2002). The Influence of Approach and Avoidance Motor Actions on Creative Cognition. *Journal of Experimental Social Psychology*, *38*(1), 41–55. https://doi.org/10.1006/jesp.2001.1488
Fugate, C. M., Zentall, S. S., & Gentry, M. (2013). Creativity and Working Memory in Gifted Students With and Without Characteristics of Attention Deficit Hyperactive Disorder. *Gifted Child Quarterly*, *57*(4), 234–246. https://doi.org/10.1177/0016986213500069
Gladwell, M. (2008). *Outliers: The story of success* (1. ed.). New York, NY: Back Bay Books.
Glenberg, A. M., Witt, J. K., & Metcalfe, J. (2013). From the Revolution to Embodiment: 25 Years of Cognitive Psychology. *Perspectives on Psychological Science : a Journal of the Association for Psychological Science*, *8*(5), 573–585. https://doi.org/10.1177/1745691613498098
Hao, N., Xue, H., Yuan, H., Wang, Q., & Runco, M. A. (2017). Enhancing creativity: Proper body posture meets proper emotion. *Acta Psychologica*, *173*, 32–40. https://doi.org/10.1016/j.actpsy.2016.12.005
Iverson, J. M., & Goldin-Meadow, S. [Susan] (1998). Why people gesture when they speak. *Nature*, *396*(6708), 228. https://doi.org/10.1038/24300
La France, M. (1982). Posture mirroring and rapport. In M. Davis (Ed.), *Interaction rhythms: Periodicity in communicative behavior.* (pp. 279–298). New York: Human Science Press.
Marstaller, L., & Burianová, H. (2013). Individual differences in the gesture effect on working memory. *Psychonomic Bulletin & Review*, *20*(3), 496–500. https://doi.org/10.3758/s13423-012-0365-0
Michalak, J., Mischnat, J., & Teismann, T. (2014). Sitting posture makes a difference-embodiment effects on depressive memory bias. *Clinical Psychology & Psychotherapy*, *21*(6), 519–524. https://doi.org/10.1002/cpp.1890
Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review : an Official Journal of the Society for Personality and Social Psychology, Inc*, *9*(3), 184–211. https://doi.org/10.1207/s15327957pspr0903_1
Peper, E. [Erik], Booiman, A., Lin, I.‑M., & Harvey, R. (2016). Increase Strength and Mood with Posture. *Biofeedback*, *44*(2), 66–72. https://doi.org/10.5298/1081-5937-44.2.04
Peper, E. [Erik], Lin, I.‑M., Harvey, R., & Perez, J. (2017). How Posture Affects Memory Recall and Mood. *Biofeedback*, *45*(2), 36–41. https://doi.org/10.5298/1081-5937-45.2.01
Ping, R., & Goldin-Meadow, S. [Susan] (2010). Gesturing saves cognitive resources when talking about nonpresent objects. *Cognitive Science*, *34*(4), 602–619. https://doi.org/10.1111/j.1551-6709.2010.01102.x
Pouw, W. T. J. L., Nooijer, J. A. de, van Gog, T., Zwaan, R. A., & Paas, F. (2014). Toward a more embedded/extended perspective on the cognitive function of gestures. *Frontiers in Psychology*, *5*, 359. https://doi.org/10.3389/fpsyg.2014.00359

Ralabate, P. (2008, 2006). *The Twice-exceptional dilemma* (First edition). Washington, D.C.: National Education Association.
Shapiro, L. A. (Ed.). (2014). *Routledge handbooks in philosophy*. *The Routledge handbook of embodied cognition* (1 edition). New York: Routledge Taylor & Francis Group.
Sullivan, J. V. (2018). Learning and Embodied Cognition: A Review and Proposal. *Psychology Learning & Teaching*, *17*(2), 128–143. https://doi.org/10.1177/1475725717752550
Sun, R. (2008). Introduction to Computational Cognitive Modeling. In R. Sun & R. Sun (Eds.), *The Cambridge Handbook of Computational Psychology* (pp. 3–20). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511816772.003
Thrasher, M., van der Zwaag, M. D., Bianchi-Berthouze, N., & Westerink, J. H. D. M. (2011). Mood Recognition Based on Upper Body Posture and Movement Features. In S. D'Mello, A. Graesser, B. Schuller, & J.-C. Martin (Eds.), *Lecture Notes in Computer Science. Affective Computing and Intelligent Interaction* (Vol. 6974, pp. 377–386). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-24600-5_41
Tsai, H.‑Y., Peper, E. [Erik], & Lin, I.‑M. (2016). EEG patterns under positive/negative body postures and emotion recall tasks. *NeuroRegulation*, *3*(1), 23–27. https://doi.org/10.15540/nr.3.1.23
Varela, F. J., Thompson, E., & Rosch, E. (2000). *The embodied mind: Cognitive science and human experience* (8. print). Cambridge, Mass.: MIT Press.
Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, *9*(4), 625–636. https://doi.org/10.3758/BF03196322
Wilson, V. E., & Peper, E. [E.] (2004). The Effects of Upright and Slumped Postures on the Recall of Positive and Negative Thoughts. *Applied Psychophysiology and Biofeedback*, *29*(3), 189–195. https://doi.org/10.1023/B:APBI.0000039057.32963.34