Impact of Autonomy Support on Performance and Perceived Exertion

The Role of Dispositional Autonomy in a Virtual Cycling Task

Simona Rindelhardt

University of Konstanz · Department of Sport Science · Sport Psychology Lab

Keywords: autonomy-supportive coaching · self-determination theory · OPTIMAL theory · endurance performance · perceived exertion · virtual cycling

BACKGROUND

Coaching behavior critically shapes athletes' motivation and performance.[1,2]

AUTONOMY SUPPORT

Self-Determination Theory[3] (SDT) posits that autonomy-supportive coaching (e.g. providing choices, acknowledging feelings, and avoiding controlling language[2]) satisfies the basic need for autonomy, driving motivation and effort.[4]

OPTIMAL Theory of Motor Learning[5] proposes that even task-irrelevant choices enhance motor learning.

Dispositional autonomy — the stable tendency toward autonomous self-regulation — may moderate how strong individuals benefit from autonomy-supportive environments.[6]

EFFORT

Effort is central to regulating exercise intensity and endurance performance[7,8] and positively influenced by autonomy-supportive coaching.[4]

STUDY AIM & HYPOTHESES

While SDT and OPTIMAL theory highlight motivational and learning benefits of autonomy support, this study experimentally compares autonomy-supportive and autonomy-restrictive coaching in their effect on effort and immediate endurance performance.

- **H1** Performance and Subjective Effort: Autonomy Support > Control > Autonomy Restriction
- **H2** Subjective Effort mediates the effect of coaching style on performance.
- **H3** Dispositional autonomy moderates the effect of coaching style on performance.

METHOD

57	29♂/28♀	∅ 26.7 (*SD* = 11.0)
Participants	Gender	Age (years)

DESIGN & TASK

- within subject design (randomized order of conditions)
- Task: Ride as far and fast as possible in 8 minutes (virtual cycling)

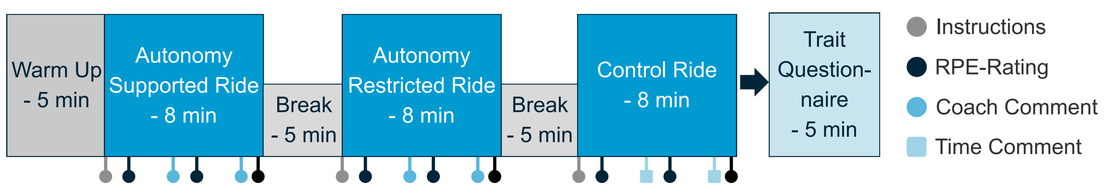

Figure 1. Schematic overview of the study procedure (randomized order of conditions)

EXPERIMENTAL MANIPULATION

Two people acted as coaches — one autonomy-supportive, one autonomy-restrictive (no coach in control condition) — differing in:

- **Choice**: Avatar's jersey selection allowed vs. denied
- **Language**: non-controlling vs. controlling
- **Feelings**: acknowledged vs. ignored

MEASURES

Performance	Subjective Effort	Dispositional Autonomy
Mean power output (W/kg) per condition	Adapted RPE CR10-Scale[9] (0-11) → Mean RPE and Max RPE per condition	Index of Autonomous Functioning (IAF)[6]

RESULTS

DESCRIPTIVE STATISTICS

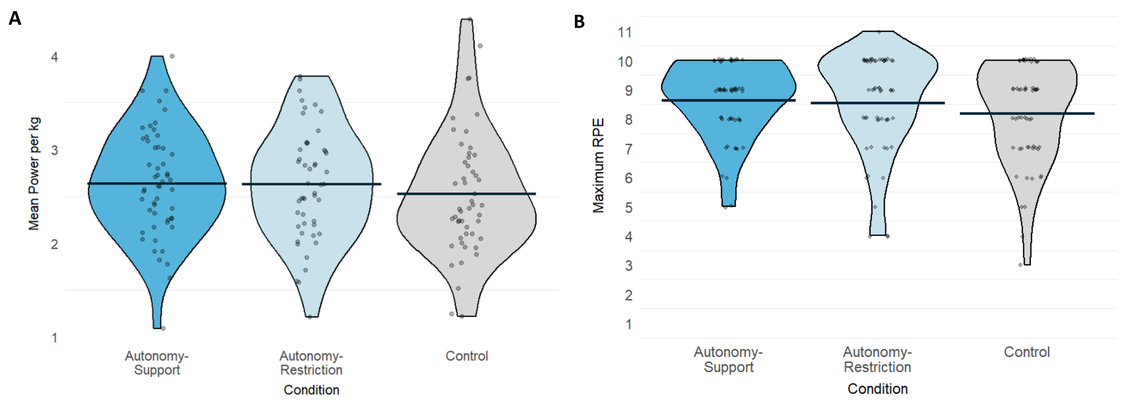

Figure 2. Distribution of mean power output (W/kg; Panel A) and max RPE (Panel B) across conditions. Horizontal lines indicate means; dots represent individual data points.

MEDIATION ANALYSIS

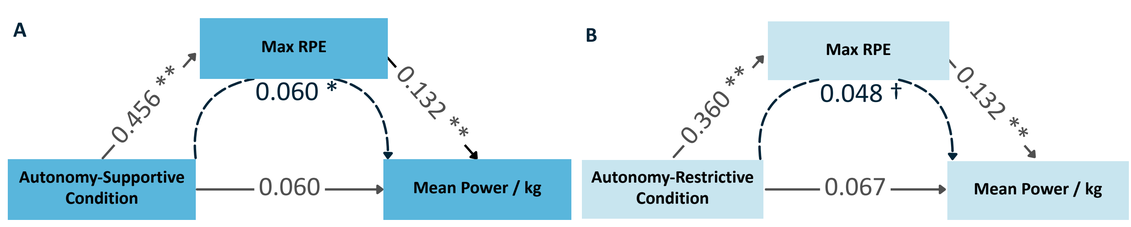

Figure 3. Indirect effects of coaching condition on performance (W/kg) via Max RPE. Panel A: autonomy-supportive vs. control; Panel B: autonomy-restrictive vs. control. Path coefficients (β) are reported. Solid arrows = direct paths; dashed arrows = indirect effects. * p < .05, ** p < .01, † p < .10.

Dispositional autonomy did not significantly moderate the effect of coaching style on performance.

DISCUSSION

Coach presence — regardless of coaching style — appears to be the key driver of short-term increased effort and indirectly improved endurance performance.

Social Facilitation: the mere presence of a coach might increase motivation and performance [10,11]

Pacing: Max RPE was a significant mediator; Mean RPE was not, likely confounded by pacing strategies early in the ride.

Dispositional Autonomy: The null moderation effect of dispositional autonomy may reflect the universal benefits of autonomy support across individuals[12], or limited sensitivity of the explicit IAF measure compared to implicit assessments.[13]

FUTURE DIRECTIONS

Long-term effects

Autonomy support may have stronger effects across multiple training sessions.

Impact on other psychological outcomes

Autonomy support may more strongly affect enjoyment and well-being, relevant for long term physical activity & performance.

REFERENCES

[1] Amorose, A. J., & Horn, T. S. (2001). Pre-to Post-Season Changes in the Intrinsic Motivation of First Year College Athletes: Relationships with Coaching Behavior and Scholarship Status. *Journal of Applied Sport Psychology, 13*(4), 355–373. https://doi.org/10.1080/104132001753226247

[2] Mageau, G. A., & Vallerand, R. J. (2003). The coach–athlete relationship: A motivational model. *Journal of Sports Science.* https://doi.org/10.1080/0264041031000140374

[3] Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. Springer Science & Business Media. https://doi.org/10.1007/978-1-4899-2271-7

[4] Mossman, L. H., Slemp, G. R., Lewis, K. J., Colla, R. H., & O'Halloran, P. (2024). Autonomy support in sport and exercise settings: a systematic review and meta-analysis. *International Review of Sport and Exercise Psychology, 17*(1), 540–563. https://doi.org/10.1080/1750984X.2022.2031252

[5] Wulf, G., & Lewthwaite, R. (2016). Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. *Psychonomic Bulletin & Review, 23*(5), 1382–1414. https://doi.org/10.3758/s13423-015-0999-9

[6] Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2012). The index of autonomous functioning: Development of a scale of human autonomy. *Journal of Research in Personality, 46*(4), 397–413. https://doi.org/10.1016/j.jrp.2012.03.007

[7] Marcora, S. (2010). Effort: Perception of. In E. B. Goldstein (Ed.), *Encyclopedia of Perception* (Vol. 1, pp. 380–383). Sage Publications.

[8] Pageaux, B. (2014). The Psychobiological Model of Endurance Performance: An Effort-Based Decision-Making Theory to Explain Self-Paced Endurance Performance. *Sports Medicine, 44*(9), 1319–1320. https://doi.org/10.1007/s40279-014-0198-2

[9] Borg, G. A. (1982). Psychophysical bases of perceived exertion. *Medicine and Science in Sports and Exercise, 14*(5), 377–381.

[10] van Meurs, E., Greve, J., & Strauss, B. (2024). Moving in the presence of others – a systematic review and meta-analysis on social facilitation. *International Review of Sport and Exercise Psychology, 17*(2), 980–1012. https://doi.org/10.1080/1750984X.2022.2111663

[11] Edwards, A. M., Dutton-Challis, L., Cottrell, D., Guy, J. H., & Hettinga, F. J. (2018). Impact of active and passive social facilitation on self-paced endurance and sprint exercise: Encouragement augments performance and motivation to exercise. *BMJ Open Sport & Exercise Medicine, 4*(1), e000368. https://doi.org/10.1136/bmjsem-2018-000368

[12] Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* The Guilford Press. https://doi.org/10.1521/978.14625/28806

[13] Schüler, J., Sheldon, K. M., Prentice, M., & Halusic, M. (2016). Do Some People Need Autonomy More Than Others? Implicit Dispositions Toward Autonomy Moderate the Effects of Felt Autonomy on Well-Being. *Journal of Personality, 84*(1), 5–20. https://doi.org/10.1111/jopy.12133

Contact: simona.rindelhardt@uni-konstanz.de