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Review

Self-control and limited willpower: Current status of ego depletion theory and research

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Ego depletion theory proposes that self-regulation depends on a limited energy resource (willpower). The simple initial theory has been refined to emphasize conservation rather than resource exhaustion, extended to encompass decision making, planning, and initiative, and linked to physical bodily energy (glucose). Recent challenges offered alternative explanations (which have largely failed) and questioned replicability (which has now been well established). Methods have improved, particularly with emphasis on longer, stronger manipulations to ensure fatigue. New work extends ego depletion into workplace settings and sports. Interpersonal conflict may be both a major cause and consequence. New questions include the possibility of chronic ego depletion (e.g., in burnout), protective factors and coping strategies, individual differences, and recovery processes.

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Introduction

Self-regulation is central to what the self is and how it functions. Good self-control confers many benefits, from career success to good social relationships to longevity.

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A limited resource model of self-regulation was first proposed in the mid-1990s, at a time when psychology focused mostly on information processing theories rather than energy or resource theories. Nevertheless, the accumulating evidence, along with an influx of biological approaches into psychology, rendered it increasingly plausible and influential. It underwent a series of refinements as new evidence led to changes. After about twenty years, it came under fire from two sources of criticism. Since then it has emerged newly confirmed and strengthened, and researchers continue to find new methods and applications. This article will provide a brief overview of this history. It will emphasize recent and current developments – but some understanding of the prior background is essential context for those.

Original idea

A review of diverse early literatures on self-regulation led to the somewhat surprising notion that self-regulation depended on a limited energy resource, similar to the folk notion of willpower [1]. One implication was that when people exerted self-control, they would deplete their willpower, so that if another self-regulation task were presented, people would perform worse than usual.

Early experiments confirmed this pattern [2]. The state of reduced willpower, as seen mainly in poor self-regulation performance, was dubbed ego depletion. The essence of the idea was that effortful self-regulation consumes energy, and until it can replenish, further acts of self-control will be less effective than usual.

Extending the theory

The view of the self as becoming unable to self-regulate due to having run out of energy was quickly discarded in favor of a conservation theory: The body naturally conserves its energy, and after it has expended some energy, it reduces further exertions so as to conserve what remains [3]. Further work showed that ego depletion affected not just self-regulation but several other executive functions. Decision making, rational intelligent thinking, planning, and initiative all used the same resource, so depletion caused by one of these could affect any of the others [4]. Other developments pursued links to the body's energy system (self-control

requires glucose in bloodstream [5]) and personality traits (people with good self-control use it to form good habits and break bad ones, so their lives are both easier and better than those of low self-controllers; [6]).

Another issue is what resource is depleted. Physiological approaches appeal to metabolic resources, glucose depletion being one main candidate (see Ref. [5], for a review). The “waste disposal hypothesis” [7] proposes instead that resource depletion corresponds to the accumulation of a toxic waste product in neutral tissue

(amyloid-beta). Others propose that the intense use of glucose leads to the production of metabolites, especially adenosine, that weaken the brain’s connectivity [4,8]. Glutamate, which may be toxic for neurons, may also accumulate in brain regions involved in self-control after hours of cognitive work [9].

Two challenges

As research findings supporting, extending, and applying ego depletion multiplied, it came under fire from two separate challenges. Table 1 summarizes these and the

Table 1

Recent challenges, broader context, and future opportunities in ego depletion research.

Challenges to Ego Depletion	Broader Context	Opportunities for Future Research
Some authors questioned the reality of ego depletion effects after claiming that replications failed, though the replications typically substituted weaker manipulations rather than the original protocol.	Hundreds of successful replications support the existence of ego depletion. The failed replications reported in the multi-site study were due to ineffective manipulations. Follow-up analyses of the multi-site study revealed that ego depletion was supported to the extent that the weak manipulation created different levels of ego depletion.	Manipulation checks should ensure that depletion actually occurs and that the control condition is not depleting
Lack of <i>motivation</i> is proposed as an alternative explanation for the effects of willpower. In this view, ego depletion is a misnomer. As opposed to depleted willpower (or ego), a lack of motivation after initial exertion explains lower performance or perseverance reported in ego depletion studies.	Multiple research teams have investigated lack of motivation as an alternative explanation for experimental results and have found no differences in motivation across experimental groups.	Further research should consider the role of motivation more thoroughly. Researchers may investigate various contexts in which effort might reduce motivation. They may also consider alternative forms of measuring motivation (other than self-report).
Ego depletion effects are due to <i>beliefs</i> about willpower rather than the depletion of an actual limited resource.	Although beliefs about whether willpower is limited (or not) produce small, consistent effects, these beliefs do not fully account for observed effects. Nevertheless, Ego Depletion Theory has been updated to incorporate beliefs as moderating factors in ego depletion.	Future research should explore <i>why</i> implicit beliefs about willpower influence self-control. Studies may investigate whether beliefs influence the rate of depletion.
Research showing that incentivization reduces ego depletion challenges notion that ego depletion effects are due to lack of internal resources.	Ego Depletion Theory has been revised to account for this research. Previous explanations assumed that individuals failed to exhibit self control because they ran out of energy. Now, ego depletion effects are considered to be the result of the body naturally conserving its remaining energy. In order to conserve energy, the body reduces further exertions unless other moderating factors (such as incentives) counteract conservation tendencies.	Further replication of conservation effects is promising. Complete exhaustion of willpower will not be seen in laboratory studies and probably not in real life. Intense use of cerebral glucose produces metabolites (e.g., adenosine, glutamate) that signal the brain to withdraw effort, thereby reducing task performance.
Ego depletion research has stagnated (failed to move forward in new directions) due to controversy about failed laboratory replications.	Although debates about replication slowed progress in ego depletion research, its effects are now being further investigated in a variety of field contexts including sports, work, and interpersonal conflict.	Future research can advance the field by moving beyond <i>whether</i> ego depletion matters into <i>why</i> ego depletion effects occur (mediating factors), and <i>when</i> ego depletion is most likely to occur or not (moderating factors). Investigating the role of situational contexts, emotions, and beliefs (about the self, the situation, or the task) will help to advance current theory. Future research may also explore factors that influence temporary versus chronic fatigue.

field's responses. One offered an alternate explanation, while the other denied that the effect exists. Obviously, (at least) one of these must be completely wrong, because there cannot be a valid alternate explanation for a nonexistent effect.

The alternative theory focused on changes in motivation [10]. It said, instead of depleted willpower, the effects were due to disengagement, to feeling that one has already exerted oneself and does not owe any further effort. Many of us immediately began to ask research participants how motivated they were to do well on the second task. But we never found any differences, nor, apparently, do other laboratories.

Meanwhile, the denial of the reality of the effect was prompted by a big multi-laboratory ostensible replication effect that failed [11]. It was not in fact a replication of any previous study. It found no effects but apparently it failed to manipulate ego depletion — thus it did not test the hypothesis. The failure was widely publicized, convincing many that ego depletion was not real. A reanalysis of the data by a different lab [12] vindicated ego depletion but was not publicized. It showed that ego depletion was significantly supported to the very limited extent that the weak manipulation managed to create different levels of ego depletion.

Most multi-site replications in social psychology fail [13], often because of inadequate manipulation. A gigantic enterprise seeks to minimize the work of many experimenters but in the process undermines effects. As of 2022, there had been 36 major multi-site replication attempts across all of social psychology, and only four had succeeded. A few more had mixed, inconclusive results, while the remaining three-fourths were complete failures.

Importantly, one of the successful four upheld ego depletion [14]. This success, combined with the general record of hundreds of successful replications, almost no significant findings in opposite direction, plus pre-registered successful replications, and abundant and diverse real-world evidence, constitute a strong argument that ego depletion is one of the very best replicated findings in social psychology [15].¹

We note that a highly vocal minority of psychologists remains skeptical of ego depletion. They typically ignore the successful replications and focus on failures. Some point to yet another multi-site replication attempt [44]. It was coordinated by Kathleen Vohs, a leading researcher in the area. Unfortunately constrained by the

¹ We invite disagreement and always ask readers/listeners to nominate a social psychology finding that they think has a better replication record. In the past two years, only one nomination has been received. If ego depletion were difficult to replicate, it should be easy to name half a dozen other findings with better records, but apparently it is not. Failures to replicate ego depletion are mostly operational failures, thus they never tested the hypothesis.

Table 2

Checklist for best practices for successful replication of ego depletion effects.

Longer and stronger manipulations produce more reliable results
 Manipulation check should ensure substantial increase in fatigue
 Control condition cannot be boring or otherwise depleting
 Live personal interaction with experimenter increases participant engagement
 Ensure manipulations and measures are suitable for participant population
 Careful attention to dropout rates, especially differential attrition
 Possibly check moderation by Depletion Sensitivity Scale [45]
 Possibly early practice on dependent measure task (to avoid learning confounds or establish baseline)

convenience requirements of multi-site projects, Vohs and colleagues settled for brief and weak manipulations. Their results were thoroughly inconclusive: They obtained a significant supportive effect with their full sample, but unexpectedly excluding over a thousand participants based on preregistered criteria dropped the effect out of significance. Consistent with best practices, they wrote the report featuring both analyses, but the journal editor directed them to feature the nonsignificant result while consigning the supportive significant finding to supplementary online materials. This anecdote converges with other evidence that journal editors prefer to published failed replications [13], but it encourages skeptics to treat it as evidence against the phenomenon. Regardless, it is important to know that skepticism remains. Table 2 provides a checklist to assist in successful replication.

These controversies reduced progress in what had been a thriving area with new ideas and refinements coming from multiple sources. It was necessary to go back and re-establish the basic phenomenon, rather than moving forward into new areas. However, progress has resumed. New evidence continues to come out to confirm basic points, such as the detriment to good behavior: Laboratory participants quit faster on a task and also cheated more following a depletion manipulation [16]. A large recent study found strong evidence of ego depletion, including sleep-like patterns in the brain and increase in antisocial behavior — using a strong manipulation (45 min spent on three different depleting tasks) [46].

Advances in methods

We now know how to produce highly replicable effects across multiple laboratories. First off, it helps to use a longer and more effortful manipulation (e.g., Ref. [17]). Ego depletion is a kind of mental fatigue, and fatigue is more pronounced after 20 min than after 5. The longer the depleting task, the stronger the effects of deterioration on subsequent physical performance [18].

Moreover, tasks involving cognitive flexibility, updating of working memory, and inhibitory control, are good candidates for generating effortful control costs [8,19] and inducing the ego-depletion effect [14,17,20,21]. The control task also should be careful not to require self-regulation: A boring control condition is also depleting [17].

A number of studies have used self-report measures of ego depletion rather than manipulating it (e.g., Ref. [22]). Two 3-item measures were developed for experience sampling research, which requires brevity [23].

Athletic performance

Recently, sport science has been a fertile area for ego depletion research. These studies extend the basic work by showing that physical performance can be impaired by mental fatigue. For example, ego depletion has been shown to impair accuracy when throwing darts or shooting basketballs [24,25], as well as reduced endurance [26] and slower reaction speed when starting a race [27]. Several meta-analyses have established the harmful effects of mental fatigue and ego depletion on athletic performance generally [28–30]. Professional footballers making football (soccer) decisions in a distracting environment became less accurate after a depletion manipulation [31].

Workplace applications

Decision fatigue and self-regulatory depletion are relevant to the psychology of work, given that people must often make decisions and discipline themselves to perform difficult tasks. Sure enough, ego depletion is damaging. Traffic court judges became less likely to dismiss charges at the end of a court session, suggesting decision fatigue, and indeed the longer the time since the judge's last rest break, the lower the probability of dismissal [32].

Working with people from other organizations is more depleting than working with members of one's own organization, possibly because of the lesser shared culture [33]. Furthermore, people who identify more strongly with their organization become more depleted when doing difficult tasks, possibly because they work harder.

Trying to take charge at work by making suggestions or introducing new procedures in the morning led to feeling more depleted later on — but only among people who felt they had little control over their work. Among those feeling more control generally, taking charge led to reporting less ego depletion [22]. Meanwhile, taking charge in the afternoon reduced ego depletion, suggesting “the vitalizing potential of proactivity.” Thus, exerting control may be depleting,

but if effective it can improve things, thereby reducing depletion.

Indeed, some jobs are so depleting that they raise the possibility of chronic depletion [34]. Listening to a speech in one language while speaking it in a second (simultaneous translation) is so depleting that it has been used as a depletion induction procedure [35].

Interpersonal conflict

One recent shift of emphasis has been highlighting interpersonal conflict as a major cause of ego depletion in daily life. The lab studies hardly ever used this, instead manipulating and measuring depletion with solitary task performances. But the first big experience sampling study of ego depletion in daily life found large effects in both directions: low or depleted self-control creates more interpersonal conflict, and more interpersonal conflict leads to depletion [23]. This obviously suggests ominous potential for vicious circles.

Many recent findings underscore the link between ego depletion and interpersonal conflict. In rural China, where teacher turnover is a problem, teachers who felt more depleted because of being the targets of gossip felt more like quitting [36]. When parents felt more depleted, they used more coercive food practices, such as insisting that the child eat or not eat something [37]. Supervisors who felt more stressed became more ego depleted and, as a result, their subordinates rated them as more abusive [38]. On an online questionnaire, Chinese students who felt more ostracized engaged in more problematic risk-taking behavior, mediated by ego depletion [39]. The effect was reduced among those who engaged in regular physical exercise.

Overcoming depletion

Some recent work has begun to look at how to overcome or counteract the negative effects of ego depletion. Veteran basketball players missed more free throws after a depletion manipulation — but a mindfulness exercise counteracted the effect [40]. In a waste sorting task, ego depletion led to earlier quitting and more mistakes, but a financial incentive for accuracy eliminated the effect [41]. Depletion from work made people feel less vitality at home, but detaching oneself from work reduced this effect [42]. A large and impressive investigation found that physical exercise and fitness improved self-control, making the person less prone to ego depletion and hence reducing deviant behavior, ranging from outright crime to misbehavior in the workplace [43].

Conclusion

Rather than weakening the ego-depletion theory, the criticism strengthened it and opened the question of ego-depletion to interdisciplinary research. Current

evidence is sufficient to characterize ego depletion as undeniably real and indeed among the very best replicated phenomena in social psychology. The importance of effective self-control to a broad variety of desirable behavior patterns makes ego depletion highly relevant to many spheres of activity, including work, sport, and interpersonal relationships.

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Author contributions

The manuscript originated in planning discussions between RB and DS. DS, NA, and DT all searched the literature for new findings. RB wrote the first and final drafts, as well as coordinating; NA wrote some parts also, while DT and DS offered helpful comments. Preparing and formatting the references were the most difficult tasks, initiated by DT, furthered by RB, but most successfully done by NA.

Declaration of competing interest

The authors declare no financial conflict of interest.

Data availability

No data was used for the research described in the article.

References

References of particular interest have been highlighted as:

- * of special interest
- ** of outstanding interest

1. Baumeister RF, Heatherton TF: **Self-regulation failure: an overview.** *Psychol Inq* 1996, **7**:1–15, https://doi.org/10.1207/s15327965pli0701_1.
2. Baumeister RF, Bratslavsky E, Muraven M, Tice DM: **Ego depletion: is the active self a limited resource?** *J Pers Soc Psychol* 1998, **74**:1252–1265. <https://psycnet.apa.org/doi/10.1037/0022-3514.74.5.1252>.
3. Muraven M, Shmueli D, Burkley E: **Conserving self-control strength.** *J Pers Soc Psychol* 2006, **91**:524–537.
4. Baumeister RF, Vohs KD: **Strength model of self-regulation as limited resource: assessment, controversies, update.** *Adv Exp Soc Psychol* 2016, **54**:67–127, <https://doi.org/10.1016/bs.aesp.2016.04.001>.
5. Gailliot M, Baumeister RF: **The physiology of willpower: linking blood glucose to self-control.** *Pers Soc Psychol Rev* 2007, **11**:303–327, <https://doi.org/10.1177/1088868307303030>.
6. de Ridder D, Lensvelt-Mulders G, Finkenauer C, Stok FM, Baumeister RF: **Taking stock of self-control: a meta-analysis of how trait self-control relates to a wide range of behaviors.** *Pers Soc Psychol Rev* 2012, **16**:76–99, <https://doi.org/10.1177/1088868311418749>.
7. Holroyd C: **The waste disposal problem of effortful control.** In *Motivation and cognitive control*. Edited by Braver T, New York, NY: Routledge; 2016:235–260.
8. André N, Audiffren M, Baumeister RF: **An integrative model of effortful control.** *Front Syst Neurosci* 2019, **13**:79, <https://doi.org/10.3389/fnsys.2019.00079>.
9. Wiehler A, Branzoli F, Adanyeguh I, Mochele F, Pessiglione M: **A neuro-metabolic account of why daylong cognitive work alters the control of economic decisions.** *Curr Biol* 2022, **32**:3564–3575.e5, <https://doi.org/10.1016/j.cub.2022.07.010>.
10. Inzlicht M, Schmeichel BJ: **What is ego depletion? Toward a mechanistic revision of the resource model of self-control.** *Perspect Psychol Sci* 2012, **7**:450–463, <https://doi.org/10.1177/1745691612454134>.
11. Hagger MS, Chatzisarantis NLD, Alberts H, Anggono CO, Batailler C, Birt AR, Brand R, Brandt MJ, Brewer G, Bruyneel S, et al.: **A multilab preregistered replication of the ego-depletion effect.** *Perspect Psychol Sci* 2016, **11**:546–573. <https://doi.org/10.1177/1745691616652873>.
12. Dang J: **Commentary: a multilab preregistered replication of the ego-depletion effect.** *Front Psychol* 2016, **7**:1155, <https://doi.org/10.3389/fpsyg.2016.01155>.
13. Baumeister RF, Tice DM, Bushman BJ: **A review of multisite replication projects in social psychology: is it viable to sustain any confidence in social psychology's knowledge base?** *Perspect Psychol Sci* 2023, **18**:912–935, <https://doi.org/10.1177/17456916221121815>.
14. Dang J, Barker P, Baumert A, Bentvelzen M, Berkman E, Buchholz N, Buczný J, Chen Z, De Cristofaro V, de Vries L, et al.: **A multilab replication of the ego depletion effect.** *Soc Psychol Personal Sci* 2021, **12**:14–24, <https://doi.org/10.1177/1948550619887702>.
15. Baumeister RF, D.M.: **Tice, ego depletion is the best replicated finding in all of social psychology.** *Sch J Psychol Behav Sci* 2022, **6**:686–688, <https://doi.org/10.32474/SJPBS.2021.06.000234>.
16. Fan W, Yang Y, Zhang W, Zhong Y: **Ego depletion and time pressure promote spontaneous deception: an event-related potential study.** *Adv Cognit Psychol* 2021, **17**:239–249, <https://doi.org/10.5709/acp-0333-8>.
17. Mangin T, André N, Benraïss A, Pageaux B, Audiffren M: **No ego depletion effect without a good control group.** *Psychol* 2021, **57**, 102033, <https://doi.org/10.1016/j.psychsport.2021.102033>.
18. Boat R, Hunte R, Welsh E, Dunn A, Treadwell E, Cooper SB: **Manipulation of the duration of the initial self-control task within the sequential-task paradigm: effect on exercise performance.** *Front Neurosci* 2020, **14**, 571312, <https://doi.org/10.3389/fnins.2020.571312>.
19. Hofmann W, Schmeichel BJ, Baddeley AD: **Executive functions and self-regulation.** *Trends Cognit Sci* 2012, **16**:174–180, <https://doi.org/10.1016/j.tics.2012.01.006>.
20. Hagger MS, Wood C, Stiff C, Chatzisarantis NLD: **Ego depletion and the strength model of self-control: a meta-analysis.** *Psychol Bull* 2010, **136**:495–525, <https://doi.org/10.1037/a0019486>.
21. Mangin T, Audiffren M, Lorcery A, Mirabelli F, Benraïss A, André N: **A plausible link between the time-on-task effect and the sequential task effect.** *Front Psychol* 2022, **13**, 998393, <https://doi.org/10.3389/fpsyg.2022.998393>.
22. Wehrt W, Sonnentag S: **When is taking charge depleting? Job control and self-control demands as moderators in daily depletion processes.** *Scand J Work Organ Psychol* 2024, **9**: 1–17, <https://doi.org/10.16993/sjowp.219>.
23. Baumeister RF, Wright BRE, Carreon D: **Self-control “in the wild”: experience sampling study of trait and state self-regulation.** *Self Ident* 2019, **18**:494–528, <https://doi.org/10.1080/15298868.2018.1478324>.
24. Englert C, Bertrams A, Furlay P, Oudejans RRD: **Is ego depletion associated with increased distractibility? Results from a basketball free throw task.** *Psychol Sport Exerc* 2015, **18**: 26–31, <https://doi.org/10.1016/j.psychsport.2014.12.001>.

25. Englert C, Bertrams A: **Anxiety, ego depletion, and sports performance.** *J Sport Exerc Psychol* 2012, **34**:580–599, <https://doi.org/10.1123/jsep.34.5.580>.
26. Van Cutsem J, Marcora S, De Pauw K, Bailey S, Meeusen R, Roelands B: **The effects of mental fatigue on physical performance: a Systematic Review.** *Sports Med* 2017, **47**:1569–1588, <https://doi.org/10.1007/s40279-016-0672-0>.
27. Englert C, Bertrams A: **The effect of ego depletion on sprint start reaction time.** *J Sport Exerc Psychol* 2014, **36**:506–515, <https://doi.org/10.1123/jsep.2014-0029>.
28. Giboin L-S, Wolff W: **The effect of ego depletion or mental fatigue on subsequent physical endurance performance: a meta-analysis.** *Perform Enhanc Health* 2019, **7**, 100150, <https://doi.org/10.1016/j.peh.2019.100150>.
29. Brown DMY, Graham JD, Innes KI, Harris S, Flemington A, Bray SR: **Effects of prior cognitive exertion on physical performance: a systematic review and meta-analysis.** *Sports Med* 2020, **50**:497–529, <https://doi.org/10.1007/s40279-019-01204-8>.
30. Habay J, Proost M, De Wachter J, Díaz-García J, De Pauw K, Meeusen R, Van Cutsem J, Roelands B: **Mental fatigue-associated decrease in table tennis performance: is there an electrophysiological signature?** *Int J Environ Res Publ Health* 2021, **18**, 12906, <https://doi.org/10.3390/ijerph182412906>.
31. Boroujeni MH, Boroujeni ST, Shahbazi M: **The effect of ego-depletion on decision making under distraction conditions in skilled female football players.** *J Appl Psychol Res* 2023, **14**:289–305, <https://doi.org/10.22059/japr.2023.333527.644072>.
32. Hemrajani R, Hobert T T: **The effects of decision fatigue on judicial behavior: a study of Arkansas traffic court outcomes.** *J Law Courts Published online* 2024:1–9, <https://doi.org/10.1017/jlc.2023.21>.
33. Fang S, Zhang L: **Effect of social identification on ego depletion of project managers: the role of project tasks and project complexity.** *Int J Proj Manag* 2021, **39**:915–927, <https://doi.org/10.1016/j.ijproman.2021.09.004>.
34. André N, Baumeister RF: **Three pathways into chronic lack of energy as a mental health complaints.** *Eur J Health Psychol* 2023, **30**:87–101. <https://psycnet.apa.org/doi/10.1027/2512-8442/a000123>.
35. Lorcery A, André N, Benraïss A, Tricot A, Audiffren M: **Weakening of working memory capacity by using a long and effortful task as the depleting task and its effect on cardiac reactivity.** *Int J Psychophysiol* 2023, **188**:54, <https://doi.org/10.1016/j.ijpsycho.2023.05.137>.
36. He C, Wei H: **Negative workplace gossip and turnover intention among Chinese rural preschool teachers: the mediation of ego depletion and the moderation of bianzhi.** *Front Psychol* 2022, **13**, 1034203, <https://doi.org/10.3389/fpsyg.2022.1034203>.
37. Tate AD, Trofholz A, Youngblood A, Goldschmidt AB, Berge JM: **Association between parental resource depletion and parent use of specific food parenting practices: an ecological momentary assessment study.** *Appetite* 2024, **199**, 107368, <https://doi.org/10.1016/j.appet.2024.107368>.
38. Saleem S, Sajid M, Arshad M, Raziq MM, Shaheen S: **Work stress, ego depletion, gender and abusive supervision: a self-regulatory perspective.** *Serv Ind J* 2024, **44**:391–411, <https://doi.org/10.1080/02642069.2022.2059073>.
39. Chen F, Wang J, Gao H, Zeng Y, Li Z, Zou H: **The relationship between ostracism and negative risk-taking behavior: the role of ego depletion and physical exercise.** *Front Psychol* 2024, **15**, 1332351, <https://doi.org/10.3389/fpsyg.2024.1332351>.
40. Shabbani F, Naderi A, Borella E, Calmeiro L: **Does a brief mindfulness intervention counteract the detrimental effects of ego-depletion in basketball free throw under pressure?** *Sport Exerc. Perform Psychol* 2020, **9**:197–215, <https://doi.org/10.1037/spy0000201>.
41. Tang J, Tian X, Li R, Liu Z, Liu P: **Financial incentives overcome ego-depletion effect in the waste separation task.** *Curr Psychol* 2024, **43**:1–11, <https://doi.org/10.1007/s12144-024-05789-w>.
42. Gombert L, Rivkin W, Schmidt K-H: **Indirect effects of daily self-control demands on subjective vitality via ego depletion: how daily psychological detachment pays off.** *Appl Psychol* 2020, **69**:325–350. <https://psycnet.apa.org/doi/10.1111/apps.12172>.
43. Tai K, Liu Y, Pitesa M, Lim S, Tong YK, Arvey R: **Fit to be good: physical fitness is negatively associated with deviance.** *J Appl Psychol* 2021, **107**:389–407, <https://doi.org/10.1037/apl0000916>.
44. Vohs KD, Schmeichel BJ, Lohmann S, Gronau QF, Finley AJ, Ainsworth SE, Alquist JL, Baker MD, Brizi A, Bunyl A, Butschek GJ, Campbell C, Capaldi J, Cau C, Chambers H, Chatzisarantis NLD, Christensen WJ, Clay SL, Curtis J, De Cristofaro V, del Rosario K, Diel K, Dogruol Y, Doi M, Donaldson TL, Eder AB, Ersoff M, Eyink JR, Falkenstein A, Fennis BM, Findley MB, Finkel EJ, Forgea V, Friese M, Fuglestad P, Garcia-Willingham NE, Geraedts LF, Gervais WM, Giacomantonio M, Gibson B, Gieseler K, Gineikiene J, Gloger EM, Gobes CM, Grande M, Hagger MS, Hartsell B, Hermann AD, Hidding JJ, Hirt ER, Hodge J, Hofman W, Howell JL, Hutton RD, Inzlicht M, James L, Johnson E, Johnson HL, Joyce SM, Joye Y, Haben HG, Kammrath LK, Kelly CN, Kissell BL, Koole SL, Krishna A, Lam C, Lee KT, Lee N, Leighton DC, Loschelder DD, Maranges HM, Masicampo EJ, Mazara K, McCarthy S, McGregor I, Mead NL, Mendes WB, Meslot C, Michalak NM, Milyavskaya M, Miyake A, Moeine-Jazani M, Muraven M, Nakahara E, Patel K, Petrocelli JV, Pollak KM, ce MM Pri, Ramsey HJ, Rath M, Robertson JA, Rockwell R, Russ IF, Salvati M, Scherer BSAunders A, Schütz A, Schmitt KN, Segerstrom SC, Serenka B, Sharpinsky K, Shaw M, Sherman J, Song Y, Sosa N, Spillane K, Stapels J, Stinnett AJ, Strawser HR, Sweeny K, Theodore D, Tonnu K, van Oldenbeuving Y, vanDellen MR, Veregara RC, Walker JS, Waugh CE, Weise F, Werner KM, Wheeler C, White RA, Wichman AL, Wiggins BJ, Wills JA, Wilson JH, Wagenmakers E-J, Albarracín D: **A multi-site preregistered paradigmatic test of the ego depletion effect.** *Psychol Sci* 2021, **32**, <https://doi.org/10.1177/0956797621989733>. 1566-158.
45. Salmon SJ, Adriaanse MA, de Vet E, Fennis BM, de Ridder DTD: **“When the going gets tough, who keeps going?” Depletion sensitivity moderates the ego-depletion effect.** *Front Psychol* 2014, **5**:e647, <https://doi.org/10.3389/fpsyg.2014.00647>.
46. E Ordali, P Marcos-Prieto, G Avvenuti, E Ricciardi, L Boncinelli, P Pietrini, G Bernardi, E Bilancini, accepted pending revisions. Prolonged exertion of self-control causes increased sleep-like frontal brain activity and changes in aggressivity and punishment. *Proc Natl Acad Sci U S A*.

Further information on references of particular interest

12. * The multi-site replication by Hagger and colleagues [11] was widely publicized as a failure to replicate ego depletion, thereby damaging the reputation of that body of work. But the failure may have been due to an inadequate and confounded manipulation. When the data were made public, Dang reanalyzed them and found that, to the slight extent that the manipulation succeeded in inducing ego depletion, the results confirmed and replicated the original findings.
13. * A comprehensive review of all multi-laboratory replications in social psychology finds that the majority are failures. Poor operationalization and weak manipulations, low engagement by participants, and lack of interpersonal contact during the experiment all emerged as contributing factors.
14. ** This landmark study was a multi-site replication of a prior ego depletion study. It was significant both with the full sample and after excluding participants based on pre-registered criteria. (The exclusions made the effect stronger.) Given the rarity with which social psychology findings succeed in multi-lab replications, this is strong testimony to the reality and replicability of ego depletion.
15. * An opinion piece challenges social psychologists to identify any findings with stronger replication records than ego depletion, which boasts 600–800 published findings by multiple laboratories and methods, mostly significant, with essentially none in the opposite direction; a successful multi-site replication (very rare in social psychology); multiple pre-registered successful replications; and multiple findings outside the laboratory.

17. * A longer manipulation of ego depletion produces more fatigue and hence a stronger effect, but if the control is long and boring, it depletes people also.
18. * Ego depletion impaired athletic performance (wall sit). The duration of the depleting task was varied randomly, and the longer manipulations were more successful at producing larger effects of depletion on the physical performance. This important study confirms the need for depletion manipulations to be long-lasting and strenuous enough to produce the effect.
29. ** A meta-analysis of 73 studies confirms that physical and athletic performance is poorer when preceded by cognitive exertion, thus consistent with ego depletion.
37. * When parents are more depleted, they are more coercive with regard to the children's eating. It can go in either direction, more insisting that the child eat something, also more forbidding the child to eat something.
38. * Supervisors who felt more stressed became more ego depleted and, as a result, their subordinates rated them as more abusive.
39. * On an online questionnaire, Chinese students who felt more ostracized engaged in more problematic risk-taking behavior. They also reported more feeling ego depleted. The ego depletion mediated the risk-taking.
41. * In a laboratory study using a waste sorting task, ego depletion led to earlier quitting and more mistakes. A financial incentive counteracted (eliminated) this effect.