

1 **Stop and Go, Where is My Flow? How and When Daily Aversive Morning Commutes**
2 **Are Negatively Related to Employees' Motivational States and Behavior at Work**

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Abstract

Despite convincing evidence about the general negative consequences of commuting for individuals and societies, our understanding of how aversive commutes are linked to employees' effectiveness at work is limited. Drawing on theories of self-regulation and by extension a conservation of resources perspective, we develop a framework that explains how an aversive morning commute—a resource-depleting experience characterized by interruptions of automated travel behaviors—impairs employees' immersion in uninterrupted work (i.e., flow), which in turn reduces employee effectiveness (i.e., work engagement, subjective performance, and OCB-I). We further delineate theoretical arguments for daily self-control demands as a boundary condition that amplifies this relation and propose the satisfaction of employees' basic needs as protective factors. Two diary studies across 10 workdays (Study 1: 53 employees, 411 day-level data points; Study 2: 91 employees, 719 day-level data points) support most of our hypotheses. Study 1 demonstrates that daily aversive morning commutes negatively affect employees' daily work engagement through lower levels of flow experiences, but only on days with high impulse control demands. In addition, we find initial support that employees' general autonomy and competence needs satisfaction attenuate this interaction. Study 2 rules out alternative mechanisms (negative affect, tension), demonstrates ego depletion as an additional mediator of the relation between aversive morning commutes and work effectiveness and replicates the hypothesized three-way interaction for daily competence need satisfaction. We critically discuss the findings and reflect on corporate interventions, which may allow people to more easily flow to and at work.

Keywords: commuting; conservation of resources; flow experience; self-regulatory

resources; employee effectiveness

52 **Stop and Go, Where is My Flow? How and When Daily Aversive Morning Commutes Are**
53 **Negatively Related to Employees' Motivational States and Behavior at Work**

54 Notwithstanding attempts to promote teleworking (Browne, 2018) and exceptional
55 circumstances during the COVID-19 pandemic (Thompson, 2020), more than 90% of employees
56 commute to work every day, with average commuting times steadily increasing (Federal
57 Statistical Office Germany, 2012; Ingraham, 2017; Office for National Statistics UK, 2014; Zhu
58 et al., 2017). Given the high prevalence of commuting, you are likely one of those people who
59 traveled from home to work this morning. How did you experience your morning commute?
60 Unfortunately, on some days, you may answer this question by describing aversive commute
61 experiences, such as referring to your morning commute as “a nightmare” (Ye & Ma, 2019) or
62 “hell” (Gerdemann, 2019) or telling “tales of a frustrated commuter” (Seay, 2019). Your
63 commute may have been slow or unpleasant or may have knocked you out of rhythm, for
64 example, because the traffic flow was interrupted by stop-and-go driving. Indeed, Kahneman and
65 Krueger (2006) suggest that people’s morning commutes tend to be among their least enjoyable
66 daily activities. You can probably vividly imagine being drained when arriving at work after such
67 an aversive commute experience. What does your organization do to help you overcome this
68 feeling and facilitate a smooth transition into the workday? Most likely “Not much.”

69 The prevalence of commuting as a necessary but often unpleasant experience has prompted
70 researchers from various fields to study its consequences for both individuals and societies. For
71 example, previous research has demonstrated the negative effects of commuting on individuals’
72 general health and well-being (Koslowsky, 1997; Lorenz, 2018; Novaco & Gonzalez, 2009;
73 VitalityHealth, 2017). Furthermore, because many employees consider that the time spent
74 commuting to work adds to their overall working hours and thus reduces their hourly wages,
75 scholars have also investigated trade-offs between pay and length of the commute (Dauth & Haller,

76 2020; Nogland & Small, 1995). On the societal level, research has provided evidence concerning
77 the broader negative impact of commuting on environmental pollution (Coria & Zhang, 2017;
78 Johansson et al., 2017), destruction of the environment through expanding and maintaining
79 infrastructure (Laurance et al., 2009), and traffic congestion (Fosgerau et al., 2018; Wu et al., 2019).
80 Overall, research suggests that commuting is largely harmful for both individuals and societies.
81 However, we cannot draw an equally rich picture of the consequences of commuting for
82 organizations in terms of whether and how employees engage with their daily work.

83 The lack of awareness of and evidence about the work-related consequences of aversive
84 morning commutes (i.e., negative subjective experiences of impeded goal attainment while
85 traveling from home to work; Stokols et al., 1978) has resulted in most organizations
86 externalizing commuting costs and neglecting the implementation of measures to protect
87 employees from the potentially harmful effects of aversive commutes. To increase organizations'
88 willingness and ability to address this focal topic, there is a need for research that links
89 commuting to organizational effectiveness (Ma & Ye, 2019) and identifies the mechanisms
90 underlying this link. Moreover, identifying contingencies that can reduce the adverse effects of
91 aversive morning commutes could provide managers with specific insights into how they can
92 alleviate the adverse organizational consequences of this somewhat unavoidable stressor through
93 appropriate interventions. Thus, our research seeks to contribute to an emerging conversation
94 about commuting spillover (i.e., interrelationships between commuting and work experiences,
95 Calderwood & Mitropoulos, 2020; Zhou et al., 2017) by examining the mechanisms and
96 boundary conditions of the link between aversive commutes and employee effectiveness.

97 From a theoretical perspective, a crucial element of an aversive morning commute is that
98 it impedes goal pursuit (i.e., arriving at work on time). In contrast to an uninterrupted commute,
99 which for the most part relies on automated cognitive processing and behaviors (Stokols et al.,

100 1978), overcoming an aversive morning commute necessitates effortful inhibition of behavioral
101 responses (e.g., abstaining from driving faster and more aggressively) and additional decision-
102 making (e.g., considering alternative routes to work). This core proposition that an aversive
103 morning commute constitutes a goal-inhibiting and resource-depleting experience characterized
104 by a shift from automated toward controlled cognitive processing underlies the conceptual link
105 between an aversive morning commute and employees' immersion in uninterrupted work. In
106 other words, we explicate that a depleting commute spills over to the workplace and reduces the
107 likelihood that employees will lose themselves in fluent peak states of motivation referred to as
108 *flow experiences* (Csikszentmihalyi & LeFevre, 1989). Flow experiences build employees'
109 resources at work and thereby facilitate *work engagement* (i.e., a pervasive positive motivational
110 state that captures the degree to which employees apply their cognitive, physical, and emotional
111 energies to their jobs), in-role behaviors (i.e., *subjective performance*, referring to the perceived
112 effective fulfillment of job duties), and extra-role behaviors (i.e., *intrapersonal organizational*
113 *citizenship behavior* [OCB-I], which refers to discretionary acts that go beyond job duties) at the
114 end of the workday. These indicators of employee effectiveness have been identified as crucial
115 predictors of organizational functioning (Call & Ployhart, in press; Christian et al., 2011).

116 Self-regulation (Muraven & Baumeister, 2000) and by extension conservation of
117 resources theory (COR; Hobfoll et al., 2018) provide a framework to delineate the proposed
118 mechanisms and identify contingencies that can modulate the adverse effects of an aversive
119 morning commute. Engaging in self-regulation, consumes individual's regulatory resources
120 resulting in *ego depletion*—a state of reduced regulatory resources (Muraven & Baumeister,
121 2000). Furthermore, the lack of resources, makes individuals more vulnerable to resource loss
122 and less capable of resource gain (Hobfoll et al., 2018). This is because reduced resources (i.e.,
123 ego depletion) trigger a resource protection mode characterized by motivational tendencies to

124 conserve and protect remaining resources (Chong et al., 2020; Giacomantonio et al., 2014;
125 Muraven et al., 2006). Integrating these propositions, we argue that the depletion of regulatory
126 resources through an aversive commute initiates a daily regulatory resource loss process, which
127 reduces the likelihood of experiencing flow. We further suggest that this resource loss process is
128 exacerbated by additional work-related self-control demands, such as the requirement to inhibit
129 spontaneous, impulsive response tendencies and emotions to maintain controlled, purposeful
130 behavior (i.e., impulse control demands, Schmidt & Neubach, 2007). This moderating effect
131 occurs because coping with self-control demands requires employees to invest regulatory
132 resources, which becomes increasingly difficult when experiencing tendencies to protect and
133 conserve said resources. Thus, coping with self-control demands when in states of ego depletion
134 after an aversive morning commute should result in an overadditive depletion of an employees'
135 regulatory resource pool, which impairs flow experiences and associated employee effectiveness.

136 COR theory not only outlines loss processes but can also be integrated with self-
137 determination theory (Ryan & Deci, 2000), which states that the satisfaction of basic psychological
138 needs at work (autonomy, competence, and relatedness) enhances intrinsic motivation associated
139 with activities at work that are congruent with deeply held values or one's 'true self' (Ryan & Deci,
140 2001). This in turn replenishes employees' pool of regulatory resources and thereby facilitates the
141 willingness to invest said resources at work (Deci & Ryan, 2001, 2008; Van den Broeck et al.,
142 2016). Expanding our theoretical framework through self-determination theory, we propose work-
143 related psychological needs satisfaction as a motivational contingency, which counteracts the
144 tendency to conserve regulatory resources through replenishing said resources (Van den Broeck et
145 al., 2016). To summarize, we propose that work-related needs satisfaction can interrupt the daily
146 regulatory resource loss process initiated by an aversive morning commute and exacerbated by
147 work-related self-control demands, which reduces flow experiences and culminates in impaired

148 employee effectiveness (cf. Figure 1).

149 Our research aims to make three contributions. First, we identify flow experiences as a
150 central mechanism of the daily link between an aversive morning commute and employee
151 effectiveness. Conceptually, connecting an interrupted travel experience (i.e., an aversive morning
152 commute) with employees' subsequent experiences of fluent, uninterrupted task work (i.e., flow)
153 unites two seemingly disparate streams of research under the umbrella of COR theory. More
154 specifically, by focusing on the role of regulatory resources in the relation between a daily aversive
155 commute and flow experiences, our research expands notions on flow as a psychological state
156 entering which requires the initial investment of regulatory resources but once it is experienced,
157 flow can replenish regulatory resources. Second, based on our integration of self-regulation and
158 COR theory, we consider self-control demands as a moderator of the proposed relationship. Based
159 on the notion that individuals enter a state of regulatory resource protection when feeling depleted,
160 we theorize that having to further self-regulate when experiencing motivational tendencies to
161 conserve resources overtaxes employees' pool of regulatory resources, which manifests in reduced
162 flow experiences. Our research thus outlines the theoretical mechanisms that can explain why
163 coping with multiple self-control demands exhibits overadditive effects (Dang, 2018; Diestel &
164 Schmidt, 2011; van Woerkom et al., 2016). Finally, our research links self-determination theory
165 with a resource protection perspective to theoretically delineate and empirically test the proposition
166 that motivational contingencies can interrupt daily resource loss processes initiated by an aversive
167 morning commute and exacerbated by self-control demands.

168 **Flow as the Link Between an Aversive Morning Commute and Work Engagement**

169 *Work-related motivational states* refer to a set of energetic forces that determine the
170 intensity, direction, and duration of an employee's efforts toward achieving a goal such as

171 completing work tasks (Pinder, 2008; Robbins & Judge, 2019). In contrast to traits, motivational
172 states fluctuate between and even within days. We seek to expand our understanding of these day-
173 to-day fluctuations by focusing on aversive morning commutes. Specifically, we draw on self-
174 regulation (Muraven & Baumeister, 2000) and by extension COR theory (Hobfoll, 1989; Hobfoll
175 et al., 2018; Hobfoll & Shirom, 2001) to explicate how an aversive commute reduces an
176 employee's experiences of peak motivation (i.e., flow), that in turn replenishes resources and
177 contributes to more global longer-lasting motivational states at work.

178 According to self-regulation theory, individuals strive to limit their use of self-regulatory
179 resources, especially when they have depleted some of those resources (Muraven et al., 2006). This
180 ties in with COR theory which suggests that a low availability of resources results in tendencies to
181 conserve remaining resources (Chong et al., 2020; Giacomantonio et al., 2014). The resource-
182 draining experience of an aversive morning commute results in a state of ego depletion (Zhou et
183 al., 2017), which entails that employees subsequently attempt to preserve their remaining
184 regulatory resources. This resource protection mode manifests when employees experience a
185 goal-inhibiting incident and subsequently work in a "state of distractibility [...] that prevents
186 employees from being fully engaged" (Leroy et al., 2020, p. 44). Interruptions require employees
187 to shift from states of automatic cognitive processing that is highly efficient and requires barely
188 any self-regulation towards states of controlled processing that are much more resource-
189 intensive, as they involve conscious planning, decision-making, and monitoring of cognitions
190 and associated behaviors (Baumeister et al., 2000). Due to its regular occurrence, commuting is
191 for most employees a habit that relies foremost on automatic processing (Elfering et al., 2013).
192 However, aversive commute experiences require employees' self-regulation to shift toward
193 controlled cognitive processing (Leroy et al., 2020). For example, employees may need to adapt

194 daily work plans when arriving later at work or decide during the commute whether to pass on
195 information about potential delays to colleagues. In turn, states of controlled cognitive
196 processing deplete regulatory resources and put employees into a resource protection mode.

197 This resource protection mode prevents employees from experiencing of positive
198 motivational states at work. Since individuals must invest resources to gain resources (Hobfoll et
199 al., 2018), a resource protection mode can paradoxically prevent flow experiences at work,
200 defined as positive motivational states that manifests in short, intensive peak experiences during
201 any activity or task. While flow is an enjoyable state that can restore regulatory resources,
202 reaching it requires initial regulatory resource investment (Csikszentmihalyi et al., 2005). For
203 example, to experience flow, employees must self-regulate to overcome initial motivational
204 barriers when beginning with a challenging work task, and, because flow does not occur
205 instantly, employees must resist distractions and interruptions when persisting with that task to
206 eventually reach this peak state of motivation. Doing so, however, becomes increasingly difficult
207 when employees are in a resource protection mode associated with states of ego depletion. The
208 absence of flow, in turn, makes employees feel less physically, cognitively, and emotionally
209 connected with their work and prevents “successful recovery from (...) energy-draining
210 experiences” (Demerouti et al., 2012, p. 278). In summary, an aversive morning commute triggers
211 a daily regulatory resource loss process that prevents the benefits of the resource-restoring function
212 of flow experiences (Demerouti et al., 2012; Sonnentag et al., 2012). This argument aligns with
213 the COR theory’s proposition that resource depletion makes individuals more vulnerable to
214 resource loss and less capable of resource gain (Hobfoll et al., 2018).

215 Expanding our argument toward employee effectiveness, we propose that employees show
216 less work engagement—a core indicator of employee effectiveness (Schneider et al., 2018)—on
217 days when they experienced flow less frequently due to an aversive morning commute. Work

218 engagement constitutes a pervasive motivational state that captures the degree to which employees
219 apply their cognitive, physical, and emotional energies to their jobs (Newton et al., 2020). In
220 contrast to flow, which represents an acute state of immersion in a particular task or activity that
221 can but does not need to be work-related, work engagement is not focused on any specific task,
222 objective, or activity but instead describes a general connection with one's work on multiple levels
223 (Demerouti et al., 2012). More specifically, work engagement encompasses a physical-energetic
224 component during work (vigor), an emotional component of being proud of the work one is doing
225 (dedication), and a cognitive component of feeling engrossed when working hard (absorption). A
226 core difference between work engagement and flow is that flow is a task-specific motivational state
227 consisting of being focused on a present activity, the merging of action and awareness, the
228 feeling that the activity is guided by an inner logic, and a change in one's experience of time
229 (Csikszentmihalyi, 1975). Supporting the conceptual uniqueness of the task-specific nature of
230 flow and the general nature of work engagement, both constructs exhibit differential
231 relationships with work outcomes (Van Ittersum, 2015).

232 The theoretical rationale for the positive link between flow and work engagement is based
233 on the resource recovery function of flow. During states of flow, employees perceive their tasks or
234 activities as interesting and enjoyable, which develops and broadens motivational resources toward
235 their job (Demerouti et al., 2012). That is, flow experiences make individuals feel more positive
236 about their jobs and can foster energy for broader work tasks beyond the activity at hand. In line
237 with this notion, two diary studies (Demerouti et al., 2012; Xanthopoulou et al., 2018) have shown
238 that flow is related to day-specific recovery and vigor as well as a lower level of end-of-workday
239 exhaustion and a reduced need for recovery. To summarize, we pose the following hypothesis:

240 *Hypothesis 1: The negative day-specific relation between an aversive morning commute*
241 *and work engagement is mediated by flow experiences.*

242 **The Moderating Role of Daily Impulse Control Demands**

243 Impulse control demands, which encompass dealing with an unfriendly customer or talking
244 politely to an unpleasant colleague reflect a prevalent daily demand for most employees. Coping
245 with this demand requires employees' self-regulation, which depletes their regulatory resources
246 (Diestel & Schmidt, 2011; Rivkin et al., 2015; Schmidt & Neubach, 2007). Field (Diestel &
247 Schmidt, 2011; van Woerkom et al., 2016) and experimental studies (Dang, 2018) have
248 demonstrated that coping with multiple self-control demands jointly overtaxes employees'
249 regulatory resources leading higher level of depletion than predicted by their additive effects.

250 The notion that multiple activities that require self-regulation might reinforce each other
251 and exert overadditive effects can be explained based on COR theory (Hobfoll & Shirom, 2001),
252 which suggests that resource loss stemming from depleting activities reduces available resources
253 for subsequent activities and makes employees more vulnerable when they are forced to expend
254 additional resources to cope with upcoming demands (van Woerkom et al., 2016). This increased
255 vulnerability emerges because depleted employees must not only self-regulate to cope with the
256 additional upcoming demands but also overcome motivational tendencies to conserve regulatory
257 resources. In other words, they are in a resource protection mode (Chong et al., 2020) that
258 sensitizes them toward further resource demands, but they cannot follow their natural tendency
259 to withdraw from these demands to replenish their regulatory resources. Instead, employees who
260 face high impulse control demands at work are prompted by their work situation to invest
261 regulatory resources to handle such demands. As such, employees who are depleted face the risk
262 of a loss spiral, which COR theory describes by stating that people with fewer resources are
263 more likely to experience further loss of resources (Hobfoll et al., 2018).

264 Transferred to the context of an aversive morning commute, the previous line of
265 argumentation implies that an employee who arrives at work in an already depleted state (Zhou et

266 al., 2017) becomes more defensive toward investing further resources (Halbesleben et al., 2014;
267 Hobfoll & Shirom, 2001). When this employee is confronted with high daily work-related impulse
268 control demands, investing regulatory resources becomes disproportionately more difficult because,
269 in addition to the depleting effect of the demand itself, the employee must overcome the urge to
270 conserve their resources. That is, the employee's state of depletion puts them into a heightened
271 resource protection mode that, according to COR theory emerges when individuals have already
272 lost resources (Chong et al., 2020; Muraven et al., 2006). In turn, the employee must invest
273 comparatively more regulatory resources to handle the demands than when in a non-depleted
274 state. Because experiencing flow necessitates the initial expenditure of regulatory resources, this
275 translates into a reduced likelihood of experiencing flow, which ultimately manifests in lower
276 work engagement. In combination, this leads to the following hypothesis:

277 *Hypothesis 2: Day-specific impulse control demands moderate the indirect negative*
278 *day-specific relation between an aversive morning commutes and work engagement via*
279 *flow experiences such that the relationship becomes stronger when impulse control*
280 *demands are high.*

281 **Basic Needs Satisfaction as a Protective Factor against the Joint Effects of an Aversive**
282 **Commute and Self-Control Demands**

283 Thus far, we focused on the regulatory resource loss process initiated by an aversive
284 morning commute and exacerbated by self-control demands. As both stressors cannot always be
285 avoided, the question of how employee effectiveness can be protected from the adverse interplay
286 of both stressors arises. To answer this question, we propose motivational contingencies as
287 potential moderators that can interrupt the regulatory resource loss process. More specifically,
288 previous research has suggested that the intrinsic motivation associated with activities that are
289 congruent with deeply held values or one's "true self" facilitates employees' optimal functioning

290 (Abuhamdeh, 2012; Ryan & Deci, 2001). According to self-determination theory (Ryan & Deci,
291 2000), the satisfaction of three basic psychological needs represents a core contingency, which
292 enhances intrinsic motivation: The need for autonomy (i.e., an individual's desire to act
293 according to integrated norms and values and thus to be the origin or source of one's behavior),
294 the need for competence (i.e., a capacity to interact effectively in a specific environment and to
295 experience opportunities to enhance and express these capabilities), and the need for relatedness
296 (i.e., a feeling of staying connected with and being cared for by significant other).

297 Drawing on COR theory's proposition that people with greater resources are less
298 vulnerable to resource loss and better positioned for resource gain (Halbesleben et al., 2014;
299 Hobfoll & Shirom, 2001), we argue that a work environment that satisfies employees' basic
300 psychological needs facilitates intrinsic (in contrast to extrinsic) motivation, which helps maintain
301 and enhance regulatory resources (Ryan & Deci, 2008). Thus, an employee whose needs are
302 satisfied can draw on an expanded pool of regulatory resources, which enhances their willingness
303 to invest said resources at work and reduces the tendency to protect their remaining regulatory
304 resources when they are depleted through an aversive morning commute. The reduced
305 susceptibility to conserving regulatory resources is particularly helpful in alleviating the
306 overadditive resource drain caused by coping with self-control demands in a depleted state because
307 it helps employees to overcome motivational tendencies to protect remaining resources, which
308 makes coping with self-control demands less depleting. Accordingly, employees with high needs
309 satisfaction still possess sufficient regulatory resources to experience flow even when confronted
310 with both an aversive morning commute and additional impulse control demands.

311 In line with theoretical and empirical calls to examine the distinct effects of each need (van
312 Den Broeck et al., 2010), we next outline the unique contribution of each need to enhance
313 employees' regulatory resource pools and reduce the tendency to conserve regulatory resources.

314 First, employees with high autonomy need satisfaction engage in work out of a sense of
315 autonomous choice and volition. This can—but does not necessarily—overlap with employees’
316 job autonomy (Cooman et al., 2013). If employees feel that their autonomy need is satisfied, they
317 experience harmonious and efficient behavioral regulation (i.e., intrinsic motivation) that
318 expands their regulatory resource pools (Ryan & Deci, 2008), which in turn helps them to avoid
319 entering a resource preservation mode associated with ego depletion. In contrast, employees with
320 low autonomy need satisfaction are more likely to engage in work out of a sense of external
321 pressure and to perceive that they cannot determine when and how to tackle work demands. This
322 lack of autonomy need fulfillment thus entails that they are in an alerted state of monitoring their
323 remaining resources, which means they need to invest much more of their remaining resources to
324 experience flow than their autonomously motivated counterparts.

325 Second, high competence need satisfaction counteracts the tendency to conserve
326 regulatory resources in the face of overadditive resource demands by facilitating automatic (as
327 opposed to controlled) cognitive processing when engaging in work-related activities
328 (Baumeister et al., 2000). Experimental (Fairclough et al., 2005) and applied (Ohly et al., 2017)
329 research supports this notion by demonstrating that being competent in a certain area facilitates
330 automated processing. As it is efficient and requires barely any self-regulation (Kaplan &
331 Berman, 2010), automatic processing helps to maintain and preserve regulatory resources for
332 challenging work tasks. To illustrate, when attempting to resolve a customer’s problem, an
333 experienced employee can draw on solutions that were effective in the past, leaving them with
334 more regulatory resources to fully focus on the interaction with the customer. In summary,
335 employees whose competence need satisfaction is high can rely on automatic processing for
336 many work tasks, which helps them to mobilize regulatory resources when confronted with
337 demands and reduces the tendency to enter a resource protection mode.

338 Third, relatedness need satisfaction helps to enhance employees' regulatory resources,
339 particularly through positive experiences when working with others. High relatedness need
340 satisfaction entails that employees regularly experience positive social interactions at work, which
341 support human flourishing (Ryan & Deci, 2001). Specifically, social support at work due to high
342 relatedness need satisfaction may enhance employees' regulatory resources and help them to
343 overcome the urge to conserve self-regulatory resources in the face of overadditive demands. For
344 one, employees who experience high relatedness need satisfaction benefit from the social drive of
345 those around them (Owens et al., 2016). That is, being able to relate to others at work is associated
346 with a motivational momentum, which makes it more likely to experience states of flow when
347 confronted with overadditive depletion of regulatory resources. To summarize, we examine the
348 moderating effects of autonomy, competence, and relatedness need satisfaction on the impact of
349 aversive commutes and impulse control demands on flow experiences and formulate the following
350 hypothesis:

351 *Hypothesis 3: Employees' satisfaction of their general work-related needs for (a)*
352 *autonomy, (b) competence, and (c) relatedness moderates the proposed moderated*
353 *mediation model such that the moderating effect of day-specific impulse control demands*
354 *on the day-specific indirect effect of an aversive morning commute on work engagement*
355 *via flow experiences becomes weaker when the satisfaction of employees' work-related*
356 *needs for (a) autonomy, (b) competence, and (c) relatedness is high.*

357 **Study 1**

358 **Method**

359 *Participants and Procedure*

360 We conducted a daily diary study to test the proposed model. The data were collected in
361 Germany via the organizational contacts of the researchers and student assistants. The research

362 protocol was developed in line with the APA Ethical Principles as the organizational policies at
363 the authors' institutions at the time of data collection for Study 1 did not require ethical approval
364 for noninvasive, survey-based research. We emailed potential participants explaining the
365 procedure of the study and asking them to complete an informed consent form. After employees
366 gave their consent, they received a pre-survey to measure demographics, general characteristics
367 of their work commute as well as basic needs satisfaction. At the end of this pre-survey,
368 participants chose 10 workdays (Monday-Friday) during the following month, on which they
369 commuted to work and wished to receive the day-specific surveys. These days could, but did not
370 have to, be consecutive. Night and shift workers were excluded from our data collection. For
371 each selected day, participants indicated their estimated times at which they planned to start and
372 finish work as well as to arrive at home after work. Subsequently, participants received three
373 surveys a day in alignment with their indicated times. We administered the morning survey one
374 hour after the start of work, the afternoon survey one hour before the end of work, and the
375 evening survey one hour after arriving at home. If participants did not complete a survey within
376 an hour after the reception, we sent a reminder. Participants had three hours to respond until the
377 specific survey was deactivated.

378 In total, 60 out of 78 contacted employees completed the pre-survey. We had to exclude
379 seven participants because they did not respond to any daily surveys. This resulted in a final
380 sample of $N = 53$ (overall response rate of 68%). On the day-level, the 53 participants provided
381 data for 411 days out of potential 530 days (53 participants x 10 days), resulting in a response
382 rate of 78%. Taking the demanding nature of the study and the fact that participants received no
383 compensation into account, our response rates of 68% on the person-level and 78% on the day-
384 level are satisfactory (e.g., Dumas & Perry-Smith, 2018; Menges et al., 2017). Moreover, we

385 examined differences in demographic characteristics between participants who completed the
386 initial survey and the daily surveys ($N = 53$) and those who only completed the initial survey (N
387 $= 7$) through t-tests. Our results indicate no significant differences in relevant demographic
388 characteristics between these groups (age: $t = 0.44$, $df = 5.67$, $p = .67$; gender: $t = -0.45$, $df =$
389 6.11 , $p = .67$; distance to work: $t = -1.17$, $df = 8.91$, $p = .27$; commute by car: $t = 0.20$, $df = 6.06$,
390 $p = .85$; commute by public transport: $t = -0.44$, $df = 6.35$, $p = .67$; commute by walking or
391 cycling: $t = 0.20$, $df = 5.82$, $p = .85$).

392 Participants worked in various sectors (17% health, 11% banking and insurance, 11% IT
393 and communication, 9% education and teaching, 9% craftsmen, 6% retail, 6% public service, 6%
394 manufacturing, and 25% in other sectors). Their age ranged from 19 to 62 years ($M = 38.00$; SD
395 $= 13.51$). The rate of female participants was 57%. Participants' distance to work ranged from 1
396 to 140 km ($M = 19.40$ km; $SD = 21.86$ km). Most participants commuted by car (62%), followed
397 by public transport (25%), and cycling and walking (13%). The average time for the commute to
398 work was 32.74 min ($SD = 23.88$ min.).

399 *Measures and Control Variables*

400 **Basic Needs Satisfaction.** We measured work-related autonomy, competence, and
401 relatedness needs satisfaction in the pre-survey with a 12-item scale from Chiniara and Bentein
402 (2016), who introduced a shortened version of the original basic needs satisfaction scale
403 developed by Van den Broeck et al. (2010). A research assistant translated the English original
404 items to German. Then the second author back-translated them to English and compared them
405 with the original items. If the translated version was different from the original, we searched for
406 a more appropriate German translation using an online dictionary and then asked a third research
407 assistant to translate the adapted German item to English again. This step ensured that we did not

408 have any discrepancies between the meaning of the German and English items. Each need was
409 measured with four items (e.g., autonomy: “How satisfied are you with the opportunities to take
410 personal initiatives in your work?”, $\alpha = .92$; competence: “How satisfied are you with the feeling
411 of being competent at doing your job?”, $\alpha = .87$, relatedness: “How satisfied are you with the
412 positive social interactions you have at work with other people?”, $\alpha = .88$). All items were rated
413 on a 5-point response scale (1 = *very dissatisfied*; 5 = *very satisfied*).

414 **Aversive Morning Commute.** We assessed aversive morning commute in the morning
415 with six items from the subscale developed by Novaco et al. (1990). Participants rated how they
416 experienced commuting to work. An exemplary item is: “Today, my commute to work was ...”
417 “crowded (e.g., heavy traffic, crowded buses) — empty”. We used the same translation-back-
418 translation procedure as outlined above. All items were rated on a 5-point Likert scale with
419 semantic differentials (e.g., 1 = *uninterrupted*; 5 = *stop and go*; α -range across days = .84 – .95).

420 **Flow Experiences.** We assessed day-specific flow experiences in the afternoon with seven
421 items from the German Flow Short Scale (Engeser & Rheinberg, 2008; Rheinberg et al., 2003).
422 Due to high cross-loadings on work engagement in our multilevel confirmatory factor analyses
423 (MCFAs), we removed three items from the original 10-item scale. Participants rated their flow
424 experiences throughout the day on a 7-point rating scale (1 = *not at all*; 7 = *a great deal*; α -range
425 across days = .81 – .93). An example is “Today, my thoughts/activities ran fluidly and smoothly.”

426 **Impulse Control Demands.** We measured day-specific impulse control demands in the
427 afternoon with six items from the German self-control demands scale (Schmidt & Neubach,
428 2007). Participants rated the degree to which they had to control day-specific impulses during
429 work on a 5-point Likert rating scale (1 = *not at all*; 5 = *a great deal*; α -range across days = .83
430 – .93). An example item is “In the last hours, my job required me not to lose my temper”.

431 **Work Engagement.** We assessed day-specific work engagement in the evening after
432 work with the German 9-item version (Sonnetag, 2003) of the Utrecht Work Engagement Scale
433 (Schaufeli et al., 2006; α -range across days = .96 – .97), which was adapted for day-specific
434 assessment and involves three facets: vigor (e.g., “Today, I felt strong and vigorous at my
435 work.”), dedication (e.g., “Today, I was enthusiastic about my job.”), and absorption (e.g.,
436 “Today, I felt happy when I was working intensely.). The response format ranges from 1 =
437 *strongly disagree* to 6 = *strongly agree*. As suggested by Xanthopoulou et al. (2009), we
438 incorporated the three facets of work engagement into a general work engagement factor.

439 **Control Variables.** We controlled for commute time because it may influence the
440 likelihood of aversive commute experiences and has been linked to decreased work motivation
441 (VitalityHealth, 2017). Commute time was measured with one item each day in the morning (i.e.,
442 “How many minutes did it take you to commute to work today?”).

443 *Construct Validity*

444 We conducted MCFAs to assess the psychometrical distinctness of our variables. In line
445 with suggestions by Dyer et al. (2005), we specified the day-level variables in our model at the
446 within- and the satisfaction of each basic need at the between person-level. To evaluate the
447 goodness of fit of our models, we used cut-off values as recommended by Hu and Bentler (1999;
448 root mean square error of approximation [RMSEA] = .06; comparative fit index [CFI] = .95;
449 standardized root mean square residual within and between [SRMRw/b] = .08). However,
450 because these cut-off points were derived from simulated data that do not take nested data
451 structures into account, a deviation from these cut-off values should not unequivocally lead to
452 rejecting the proposed theoretical model (Williams et al., 2020). The results of MCFAs
453 examining different models are presented in Table 1. In line with our theoretical propositions a

454 model, which distinguishes between all variables on the between (3-Factors: autonomy,
455 competence, and relatedness need satisfaction) and the within-person level (4-Factors: Aversive
456 morning commute, flow experience, impulse control demands, and work engagement) yielded a
457 satisfactory fit: $\chi^2(395) = 1053.97, p < .01, RMSEA = .064, CFI = .914, SRMR_{w/b} = .059/.096$
458 and performed better than any other model in which we combined different variables into a
459 single factor.

460 *Analytical Procedure*

461 We published the data for Study 1 and the Mplus codes for the analysis presented in the
462 results section on the Open Science Framework (doi:10.17605/OSF.IO/DMVTQ). Because day-
463 level data were nested within person-level data, our hypotheses were tested through Multilevel
464 Structure Equation Modelling (MSEM; see Preacher et al., 2010) in Mplus 8.2 (Muthén &
465 Muthén, 1998-2012). This method allows for analyses on multiple levels and is less prone to bias
466 than more traditional approaches to multilevel mediation analysis (e.g., Multilevel Modelling; for
467 further information see Preacher et al., 2010). We examined our hypotheses by specifying a 1-1-1
468 moderated mediation model with random slopes (Preacher et al., 2010) and maximum likelihood
469 estimation with robust standard errors.

470 On the within-person level, we specified three random slopes, which vary across Level-2
471 units, for the relationships between aversive morning commute (X), impulse control demands
472 (W), and the interaction of aversive morning commute and impulse control demands (X*W) on
473 the one hand and flow experiences (M) on the other hand. Subsequently, work engagement (Y)
474 was predicted by aversive morning commute (X) and flow experiences (M). On the between-
475 person level, we specified satisfaction of each basic need (Z1, Z2, Z3) to predict both
476 endogenous variables (i.e., flow experiences and work engagement). Moreover, each need was

477 specified to predict all three random slopes. The direct effects of each cross-level moderator on
478 all random slopes correspond with two-way interactions of the main predictor and these variables
479 ($X*Z$ and $W*Z$) in traditional moderation analyses (Dawson & Richter, 2006). The relation of
480 the satisfaction of each need with the random slope linking the interaction between aversive
481 morning commute and impulse control demands to flow experiences represents three-way
482 interaction for each need ($X*W*Z$).

483 Following Hofmann and Gavin (1998) and Ohly et al. (2010), we person-mean centered
484 all exogenous Level-1 variables to statistically control for potential between-person differences
485 related to these constructs (i.e., distance to work) by removing these from the data. Because we
486 use MSEM and specify flow and work engagement on both levels the variance of these variables
487 is decomposed into a within- and between-person part, which on the within-person level is
488 equivalent to person-mean centering (Preacher et al., 2010) but does not change the between-
489 level intercept of these variables to zero. Finally, as on the between-person level basic needs
490 satisfaction are highly correlated (see Table 2), we applied residual centering to orthogonalize the
491 items to measure the satisfaction of each need from the other two (Geldhof et al., 2013). This
492 procedure removes the collinearity between the satisfaction of one need to the other two needs
493 from the model (Geldhof et al., 2013), which also allows us to examine the unique moderating
494 role of each need. To avoid reintroducing multicollinearity between needs by simultaneously
495 examining orthogonalized variables (i.e., double orthogonalization; Geldhof et al., 2013), we
496 specified multiple models to test the proposed three-way interactions. Following the procedure
497 outlined by Geldhof et al., (2013) we applied residual centering at the item level. In Model 1, we
498 centered autonomy need satisfaction by regressing all items of competence and relatedness need
499 satisfaction on each of the items measuring autonomy need satisfaction. In Models 2 and 3 we
500 applied the same procedure to competence and relatedness need satisfaction. In all three models,

501 we also added the raw scores of those needs, which were not-residually centered. To facilitate the
502 interpretation of coefficients we grand mean centered all three needs (Enders & Tofighi, 2007).

503 Because the conventional bootstrapping method of re-sampling cannot be applied in
504 multilevel modeling (Preacher & Selig, 2012; Van der Leeden et al., 2008), we utilized a Monte
505 Carlo approach of re-sampling to estimate confidence intervals for the indirect effects to test the
506 proposed mediation hypotheses (Preacher & Selig, 2012). Specifically, we computed bias-
507 corrected 95% confidence intervals (CI) based on 20,000 re-samples using the software provided
508 by Preacher and Selig (2012). For testing the moderated mediation effects, we extended the above
509 procedure to test conditional indirect effects where the magnitude of the first-stage coefficient was
510 calculated at a lower ($-1 SD$) and higher ($+1 SD$) levels of impulse control demands and basic
511 needs satisfaction (Koopman et al., 2016; Lanaj et al., 2014). The presence of an indirect effect is
512 rejected if a corresponding confidence interval does include zero (Preacher et al., 2007).

513 **Results**

514 Table 2 displays descriptive statistics, internal consistencies, and correlations among all
515 Study 1 variables. Before testing our hypotheses, we examined the focal variables' within- and
516 between-person variation. For aversive morning commute, impulse control demands, flow
517 experience, and work engagement the proportions of within-person variance were 69.1%, 37.2%,
518 42.1%, and 23.2%, respectively, justifying the application of multilevel modeling.

519 Table 3 shows the results of our multilevel structure equation models. Where the results
520 between the three tested models correspond with the results of Model 1, we will exemplarily
521 present the results of Model 1. With regard to direct effects, our data show a negative relation
522 between day-specific aversive morning commute and flow experiences ($\gamma = -.15, p < .01$), and a
523 positive relation between flow experiences and work engagement ($\gamma = .48, p < .01$). Hypothesis 1
524 suggests an indirect effect of an aversive morning commute on work engagement through

525 reduced flow experiences. Our data supports this hypothesis as the 95% CI for the indirect effect
526 did not include zero ($\gamma = -.07, p < .01$; 95% CI [-.129, -.025]).

527 Hypothesis 2 proposes that impulse control demands moderate the indirect effect of an
528 aversive morning commute on work engagement through flow experiences. In support of this
529 hypothesis, the random slope of aversive morning commute (AC) \times impulse control (IC) demands
530 interaction, and flow experiences was significant ($\gamma = -.23, p = .02$). To explore this within-
531 person interaction, we plotted the relationship at conditional values of impulse control demands
532 ($\pm 1 SD$; Cohen et al., 2003). Figure 2 demonstrates that only on days when impulse control
533 demands are higher than a person's average there is a significant negative relation between
534 aversive morning commute and flow experiences at work. To examine the proposed moderated
535 mediation hypothesis, we again computed the conditional indirect effects for low and high levels of
536 day-specific impulse control demands. In line with Hypothesis 2, the 95% CI of the indirect effect
537 from aversive morning commute on work engagement through flow experiences on days with high
538 levels of impulse control demands did not include zero ($\gamma = -.15, p < .01$; 95% CI [-.239, -.061]).
539 Whereas this indirect effect was not significant on days with low levels of impulse control
540 demands ($\gamma = .00, p = .95$; 95% CI [-.077, .068]). The difference between these conditional
541 indirect effects was also significant ($\gamma = -.14, p = .02$; 95% CI [-.271, -.021]).

542 Hypotheses 3a-c suggest basic needs satisfaction for autonomy, competence, and
543 relatedness as cross-level moderators of the AC \times IC interaction. Accordingly, we argue that the
544 moderated mediation via flow experiences is weaker for individuals with high (a) autonomy, (b)
545 competence, and (c) relatedness needs satisfaction. Our results do not support the proposed
546 moderating effects for the unique effect of each need as the three-way interactions for each
547 residually centered need did not become significant (Model 1 - AC \times IC \times autonomy need

548 satisfaction (NSA): $\gamma = .00, p = .99$; Model 2 - AC×IC× competence need satisfaction (NSC): γ
549 = $.20, p = .38$; Model 3 - AC×IC×relatedness need satisfaction (NSR): $\gamma = -.03, p = .78$). Yet, in
550 Models 1 and 2 where we applied residual centering to autonomy and competence need
551 satisfaction, the three-way interaction for the raw scores (non-residual centered) of autonomy and
552 competence needs satisfaction became significant (Model 1 - AC×IC×NSC: $\gamma = .25, p = .02$;
553 Model 2: AC×IC×NSCA: $\gamma = .17, p = .03$). Residual centering did not affect the results for
554 relatedness need satisfaction. Thus, our data did not support the proposed three-way interaction
555 effect for relatedness need satisfaction. In sum, comparing the results of the first two- (cf. Model 1
556 and 2) to the last model (cf. Model 3) indicates that the three-way interactions for autonomy or
557 competence need satisfaction become significant once the collinearity between these needs is
558 removed from the data through residually centering to one of the needs. Moreover, the fact that
559 three-way interactions is significant for the non-residually centered autonomy (cf. Model 2) and
560 competence (cf. Model 1) needs satisfaction strongly suggests that the shared variance between
561 person-level autonomy and competence needs satisfaction is responsible for the three-way
562 interaction effect. We draw this conclusion because the shared variance is still present in each non-
563 centered need whereas it is removed from the residually centered need.

564 We further examined whether the patterns of these three-way interaction effects of the non-
565 residually centered needs correspond with our predictions by plotting the interactions and
566 conducting simple slope tests (Dawson & Richter, 2006; see Figure 3). Pairwise slope difference
567 tests to compare the slopes for high (+1SD) and low (-1SD) levels of person-level basic needs
568 satisfaction and day-level impulse control demands suggest that for individuals with higher
569 competence (Model 1: Slope difference = $-0.05, t = -0.32, p = .75$) or autonomy (Model 2: Slope
570 difference = $-0.11, t = -0.71, p = .48$) need satisfaction there was no significant difference in slopes

571 for days with higher compared to lower day-specific impulse control demands. In contrast, for
572 employees who experience lower competence- (Model 1: Slope difference = -0.54, $t = -2.96$, p
573 $< .01$) or autonomy (Model 2: Slope difference = -0.54, $t = -3.38$, $p < .01$) need satisfaction, there
574 was a significant difference between slopes for days with high compared to low impulse control
575 demands.

576 We also examined the conditional indirect effects for all four combinations of needs
577 satisfaction (higher vs. lower) and impulse control demands (higher vs. lower). The results show
578 that for individuals with higher competence- or autonomy need satisfaction on days with both
579 higher and lower impulse control demands there was no indirect effect of an aversive morning
580 commute on work engagement through flow experiences (cf. Table 3). Accordingly, the
581 difference between conditional indirect effects for higher as compared to lower daily levels of
582 impulse control demands was not significant for individuals with higher competence- (Model 1:
583 $\gamma = -.02$, $p = .74$; 95% CI [-.167, .109]) or autonomy (Model 2: $\gamma = -.05$, $p = .49$; 95% CI
584 [-.205, .095]) need satisfaction.

585 For individuals with lower levels of competence or autonomy needs satisfaction, there
586 was also no significant indirect effect of an aversive morning on work engagement on days with
587 lower levels of impulse control demands (cf. Table 3), whereas on days with higher impulse
588 control demands there was a significant adverse indirect effect of an aversive morning commute
589 on work engagement via flow experiences (cf. Table 3). The difference between the previously
590 mentioned conditional indirect effects became significant for individuals with lower competence
591 (Model 1: $\gamma = -.26$ $p < .01$; 95% CI [-.432, -.093]) or lower autonomy need satisfaction (Model 2:
592 $\gamma = -.26$, $p < .01$; 95% CI [-.403, -.116]).

593 Finally, we calculated the amounts of variance in our endogenous variables explained by
594 our predictors. As traditional R^2 values are not available for MSEM, we followed

595 recommendations by Snijders and Bosker (2012); for discussion of the validity of this approach
596 see also LaHuis et al., 2014). The predictors explained 40.2% of the total variance for flow
597 experiences and 38.5% for work engagement at the within-person level. These proportions of
598 explained variance do not only support the theoretical, but also practical relevance of our model.

599 *Additional Analyses*

600 To test the robustness of our findings, we examined the relevance of previous day
601 endogenous variables for our results. On the within-person level for each endogenous variable
602 (flow experiences and work engagement), we specified the same variable measured on the
603 previous day as a predictor. As our diary study involved ten workdays, we also controlled for
604 cyclical effects, as the repeated presentation of survey measures across time may affect
605 participants' responses (Beal & Ghandour, 2011; Gabriel et al., 2019). Accordingly, we added
606 day, sine of day, and cosine of day to predict both endogenous variables. The results demonstrate
607 that the matching previous day predictors (t-1 - flow experiences and work engagement) were
608 significantly related to each outcome (t - flow experiences and work engagement), whereas there
609 were no significant cyclical effects. Notably, the inclusion of both previous-day predictors and
610 cyclical effects did not affect the main findings of our study.

611 In line with current recommendations to expand the interpretability of significance
612 values, we also conducted post-hoc power analyses. The results of these analyses reflect the
613 probability of replicating our findings (Bliese & Wang, 2020). These analyses indicate that for
614 the main and indirect effects of an aversive morning commute on work engagement via flow
615 experiences observed power was in line with recommendations of at least 80% (all t's > 2.81;
616 Bliese & Wang, 2020). However, the observed power for the two-way interaction of aversive
617 morning commute and impulse control demands was 62.9%, while the observed power values

618 for the three-way interactions involving autonomy and competence needs satisfaction analyses
619 were 59.1% and 68.5%, respectively. These probabilities indicate a higher likelihood of detecting
620 the proposed direct and indirect effects in a follow-up study with the same sample size compared
621 to the proposed two- and three-way interaction effects.

622 **Discussion Study 1**

623 The results of Study 1 support a daily adverse chain of effects linking aversive morning
624 commutes to work engagement through flow experiences. This indirect relation was exacerbated
625 on days with high impulse control demands. Furthermore, we found support for the proposed
626 cross-level three-way interactions for autonomy and competence needs satisfaction, such that for
627 individuals with higher autonomy and competence needs satisfaction, flow experiences were less
628 impaired by the regulatory resource loss process initiated by an aversive morning commute and
629 exacerbated by self-control demands.

630 Despite its contributions, Study 1 is subject to at least four limitations, which we
631 addressed in a second study. First, in line with previous research on the depleting effects of pre-
632 work experiences (Lanaj et al., 2014; Zhou et al., 2017), our theoretical argument suggests ego
633 depletion as an additional mediator in our model. More specifically, we argue that an aversive
634 morning commute depletes regulatory resources, which makes it more difficult for employees to
635 experience flow. Our moderated mediation model and, in particular, the two-way interaction with
636 impulse control demands support this proposition. Nevertheless, in Study 1, we do not explicitly
637 examine regulatory resource depletion as a mediator. Despite the strong theoretical rationale for
638 regulatory resource depletion as the core mechanism underlying the adverse effects of aversive
639 morning commutes, alternative mechanisms could also be responsible for the detrimental impact
640 of aversive commutes. For example, the transactional model of driver stress suggests that
641 aversive commute experiences induce negative affective states and tension, which in turn impair

642 work-related outcomes (Matthews, 2002). To further disentangle the proposed mechanisms
643 linking aversive morning commutes to employee effectiveness, in Study 2, we tested ego
644 depletion after the commute as an additional mediator of the proposed relations while controlling
645 for negative affect and tension as potential alternative mechanisms.

646 Second, we separated the measurement times of our mediator flow experiences and our
647 outcome work engagement in Study 1, but both variables still referred to the entire workday. As
648 such, we did not explicitly consider that flow experiences precede work engagement. We
649 therefore further disentangled these relations in Study 2 by examining time-lagged relationships
650 between flow experiences and work-related outcomes (see Rivkin et al., 2018).

651 Third, while we selected work engagement as an outcome that is highly relevant for
652 organizational functioning (Christian et al., 2011; Halbesleben, 2010; Knight et al., 2017),
653 scholars in the resource-based tradition have also expressed interest in behavioral performance
654 outcomes (Call & Ployhart, in press). This call has also been echoed in the emerging literature on
655 the spillover effects of commuting on behavioral indicators of employee effectiveness
656 (Calderwood & Mitropoulos, 2020). To expand our contribution, we also examined in-role and
657 extra-role performance as additional outcomes in Study 2. Because performing well in core and
658 extra-role tasks at work on a given day requires self-regulatory resources (Binnewies et al., 2009)
659 that employees can obtain through flow experiences (Bakker et al., 2011; Kasa & Hassan, 2015),
660 we argue that the adverse spillover effects of aversive morning commutes should also reduce
661 employees' in-role and extra-role performance (see Schaeffer et al., 1988).

662 To summarize, we addressed the shortcomings of Study 1 by explicitly studying ego
663 depletion as an additional mediator and by expanding the range of outcomes to include
664 behavioral indicators of employee effectiveness.

665 *Hypothesis 4: The negative day-specific relation between employees' perceptions of an*
666 *aversive morning commute and (a) work engagement, (b) subjective performance, and (c)*
667 *OCB-I is sequentially mediated by ego depletion and flow experiences.*

668 The fourth limitation of Study 1 concerns the three-way cross-level interactions involving
669 person-level general basic needs satisfaction. Whereas work-related needs satisfaction has most
670 typically been studied as a person-level variable that reflects traits or trait-like terms, a growing
671 body of research has highlighted the pivotal role of daily (within-person) fluctuations in work-
672 related needs satisfaction (De Gieter et al., 2018; Hewett et al., 2017; Reis et al., 2000; van Hooff
673 & Geurts, 2015). However, thus far, it is not clear whether it is reasonable to expect homology
674 between more long-term person- and more short-term day-level satisfaction of basic needs, as
675 person- and day-level relations can differ (Chen et al., 2005; Reis et al., 2000). More specifically,
676 person-level studies focus on the effects of employees' general need fulfillment at work, whereas
677 day-level studies investigate daily fluctuations in need fulfillment as compared to an employees'
678 baseline (Reis et al., 2000).

679 To address the question of homology, we examined day-level basic needs satisfaction in
680 Study 2 as a protective factor against the joint effects of ego depletion following an aversive
681 morning commute and daily impulse control demands. We investigated the proposed three-way
682 interactions on the relation between ego depletion and flow experience rather than the link
683 between aversive morning commute and ego depletion (see Figure 1) because, in line with
684 previous research (Chong et al., in press; Lanaj et al., 2014; Tong et al., 2019), we do not expect
685 basic needs satisfaction to prevent the depleting effects of stressors that require self-regulation
686 (such as an aversive morning commute); instead, we expect that it will mitigate the impact of
687 resource loss processes on subsequent experiences and behaviors at work. Accordingly, our
688 theoretical argument suggests that high basic needs satisfaction restores employees' regulatory

689 resource pools thereby interrupting the regulatory resource loss processes initiated by aversive
690 morning commutes and exacerbated by daily impulse control demands.

691 Besides testing for homologous effects, the focus on day-level needs satisfaction allowed
692 us to further disentangle the unique moderating effects of each need. In line with previous
693 evidence that indicates substantial correlations among autonomy and competence need
694 satisfaction at the between-person level (Van den Broeck et al., 2016), Study 1 suggests that the
695 common variance of autonomy and competence need satisfaction is responsible for the protective
696 function of those needs. However, initial evidence from within-person research on needs
697 satisfaction suggests that day-specific autonomy and competence need satisfaction share less
698 common variance as indicated by the weaker correlations of these needs on the within- as
699 compared to the between-person level (de Gieter et al., 2018; Ilies et al., 2017). This weaker
700 correlation may therefore allow us to examine whether the unique daily satisfaction of each need
701 can protect employee effectiveness from the regulatory resource loss process initiated by an
702 aversive morning commute.

703 First, on days when an employee's autonomy need satisfaction is particularly high, they
704 may experience a satisfactory degree of freedom to do their work as they prefer and to engage in
705 work tasks at their own pace. These experiences enhance the employee's regulatory resource
706 pools through positive feelings of agency and intrinsic motivation (Csikszentmihalyi, 1975;
707 Engeser & Schiepe-Tiska, 2012). Accordingly, the satisfaction of having autonomous control over
708 their work should reduce the depleting nature of having to cope with self-control demands when
709 in states of ego depletion, leaving employees' with sufficient regulatory resources to fully engage
710 in work tasks, which increases the likelihood to experience flow at work on that day.

711 Second, on days with particularly high competence need fulfillment, employees experience
712 a higher degree of less effortful automatic cognitive processing as opposed to more effortful

713 controlled processing while working (Kaplan & Berman, 2010), which helps maintain their pool of
714 regulatory resources and reduce tendencies to conserve said resources. As such, regulatory
715 resource-draining experiences (e.g., an aversive morning commute and impulse control demands)
716 should not prevent an employee who experiences high daily competence need satisfaction from
717 engaging in challenging work tasks. Accordingly, employees may still experience peak episodes
718 of flow in the face of high demands on a day at which their need for competence is satisfied.

719 Third, on days with particularly high relatedness need satisfaction, employees experience
720 many fulfilling social encounters at work. We expect that the perceived social connectedness and
721 support on that day replenishes an employees' regulatory resource pool (Ryan & Deci, 2001),
722 thus preventing them from entering a resource protection mode, which in turn helps protect their
723 flow experiences from having to cope with impulse control demands in a depleted state. In
724 contrast, on days when an already depleted employee does not feel supported by and connected
725 with others at work, dealing with additional demands can quickly put people in a narrow-minded
726 cognitive state of maladaptive affect-focused rumination (Gabriel et al., 2020) and self-
727 awareness (see Leary, 2005).

728 In sum, our theoretical arguments and empirical evidence support the proposed homology
729 regarding the role of person- and day-level basic needs satisfaction in our research model.

730 *Hypothesis 5: Employees' impulse control demands and satisfaction of their day-specific*
731 *work-related needs for (a) autonomy, (b) competence, and (c) relatedness moderate the*
732 *proposed moderated mediation model, such that the moderating effect of day-specific*
733 *impulse control demands on the day-specific indirect effect of an aversive morning*
734 *commute on work engagement, subjective performance, and OCB-I via ego depletion and*
735 *flow experiences becomes weaker when the satisfaction of employees' day-specific needs*
736 *for (a) autonomy, (b) competence, and (c) relatedness is high.*

737 **Study 2**738 **Method**739 *Participants and Procedure*

740 The data collection was conducted as part of a larger study via Prolific Academic in the
741 UK, an online provider that offers access to participants and guarantees high-quality data (Palan
742 & Schitter, 2018; Peer et al., 2017). Walter et al. (2019) have shown that data collected via online
743 providers possess similar psychometric properties and produce criterion validity that generally
744 falls within the credibility intervals of existing meta-analytic results from conventionally sourced
745 data. Previous research has demonstrated that compared to participants recruited via other
746 platforms (e.g., Mechanical Turk, Crowd Flower), participants recruited via Prolific Academic
747 are more diverse and produce higher-quality data (Palan & Schitter, 2018; Peer et al., 2017).

748 The research protocol for Study 2 was approved by the Norwich Business School's
749 Research Ethics Committee. First, we selected participants for Study 2 by conducting an
750 eligibility check. Eligible participants had to be at least 18 years old, work full-time in the UK
751 (no shift work), and commute to work at least four workdays between Monday and Friday during
752 the time of the data collection. We screened $N = 211$ participants, of whom $N = 108$ participants
753 were eligible. These 108 employees received a pre-survey (as in Study 1) with an informed
754 consent form. This pre-survey was completed by $N = 98$ participants. In this pre-survey, we
755 asked participants to estimate the times at which they started work and arrived at home on each
756 workday in the two weeks starting on the following Monday. Depending on the indicated times,
757 each participant received three surveys a day. The morning survey was administered one hour
758 after the start of work, the noon survey four hours after the start of work, and the evening survey
759 one hour after arriving at home. As in Study 1, participants received a reminder if they did not

760 complete a survey within an hour after receipt. After receiving each survey, participants were
761 given 2.5 hours to respond; thereafter, the specific survey was automatically deactivated.
762 Participants received compensation of £0.50 for each completed survey. In line with Gabriel and
763 colleagues' (2019) recommendations to increase the response rate, we offered a conditional
764 monetary incentive of £10.00 if participants completed all surveys on seven out of ten days.

765 We excluded seven participants (from the initial $N = 98$ responses) who did not complete
766 any daily surveys. In total, $N = 91$ employees (84% response rate on the person-level) completed
767 surveys in a period of 10 days, resulting in 719 day-level data points (7.90 days per employee;
768 79% response rate on the day-level). While the response rate on the person-level was higher than
769 in Study 1, the day-level response rate was comparable. We also examined differences in relevant
770 demographic characteristics between participants who completed the initial survey and the daily
771 surveys ($N = 91$) and those who did not complete the daily surveys ($N = 7$). Our results suggest
772 that respondents' were older than non-respondents ($t = 3.96$, $df = 13.52$, $p < .01$) and were more
773 likely to commute by public transport ($t = 5.04$, $df = 90.00$, $p < .01$); otherwise there were no
774 significant differences in demographic characteristics between both groups (distance to work: $t =$
775 -0.57 , $df = 9.12$, $p = .58$; gender: $t = 0.23$, $df = 6.90$, $p = .83$; commute via car: $t = 1.74$, $df =$
776 7.67 , $p = .12$; commute via walking or cycling: $t = 0.07$, $df = 6.88$, $p = .94$).

777 Participants (77 % female) worked in various sectors (17% teaching & education, 10% IT
778 & communication, 9% health, 9% finance & insurance, 8% construction, 7% retail, 7% public
779 administration, 7% science, 26% in other sectors). Their age ranged from 20 to 65 years ($M =$
780 36.70 ; $SD = 10.42$) and their distance to work from 0.5 to 61 miles ($M = 9.77$; $SD = 10.91$). Most
781 participants commuted by car (59%), followed by public transport (22%), and cycling and
782 walking (15%). The mean time of the commute to work was 31.91 min ($SD = 21.27$ min).

783 *Measures and Control Variables*

784 We used the same scales as in Study 1 to measure aversive morning commute (morning; α -
785 range across days = .83 – .90), flow experiences (noon; α -range across days = .87 – .93), impulse
786 control demands (noon; α -range across days = .90 – .98), and work engagement (evening; α -
787 range across days = .95 – .96). Moreover, we rephrased the items of the autonomy (noon; α -
788 range across days = .92 – .96), competence (noon; α -range across days = .86 – .96), and
789 relatedness (noon; α -range across days = .89 - .96) need satisfaction scales so that these referred
790 to day-specific basic needs satisfaction.

791 **Ego Depletion.** We measured ego depletion in the morning with five items from Ciarocco
792 et al.'s scale (2010). Participants rated the statements in regard to how they feel right now on a 5-
793 point rating scale (1 = *strongly disagree*; 5 = *strongly agree*; α -range across days = .94 – .96). An
794 example is “Right now, I feel like my willpower is gone”.

795 **Subjective Performance.** We measured day-specific subjective performance in the
796 evening with two items (Williams & Anderson, 1991). Participants assessed their level of
797 engagement in their core job activities on a 7-point Likert rating scale (1 = *not at all*; 7 = *a great*
798 *deal*; α -range across days = .86 – .96). An example is “Today, I performed tasks that were
799 expected of me.”

800 **OCB-I.** Day-specific OCB-I was assessed in the evening with four items (Williams &
801 Anderson, 1991). Participants rated day-specific OCB-I on a 6-point intensity-rating scale (1 =
802 *not at all*; 6 = *a great deal*; α -range across days = .92 – .96). An example is “Today, I helped
803 others at work.”

804 **Control Variables.** To demonstrate that ego depletion constitutes a dominant mechanism
805 that underlies the adverse effects of aversive morning commutes and to rule out alternative

806 explanations, we controlled for negative affect and tension in our analyses. Both constructs were
807 rated on 5-Point Likert scales (1 = *Very slightly/not at all*; 5 = *Extremely*) and assessed in the
808 morning. Negative affect was measured with six items (see Sonnentag et al., 2008) that were
809 based on the Positive and Negative Affect Schedule (Watson et al., 1988; α -range across days
810 = .84 – .95). An exemplary item is “Right now, I feel upset”. Tension was measured with six
811 items from the Profile Mood States (Shacham, 1983; α = .82 – .96). An exemplary item is “Right
812 now, I feel tense”. As in Study 1, we also controlled for commute time.

813 *Construct Validity*

814 As in Study 1, we assessed the psychometrical distinctness of our day-level measures
815 with MCFAs. Since Study 2 exclusively focused on within-person relations, we specified all
816 variables on the within-person level (Dyer et al., 2005). As theoretically proposed, a 12-Factor
817 model on the within-person level in which each of our variables is represented as a distinct factor
818 yielded an acceptable fit ($\chi^2(1824) = 4430.41, p < .01, RMSEA = .045, CFI = .904, SRMRw$
819 = .046; cf., Table 1). This model exhibited a better data fit than any alternative model in which
820 we specified different variables as a single factor (cf., Table 1).

821 *Analytical Procedure*

822 We provide the data for Study 2 and Mplus codes on the website of the Open Science
823 Framework (doi:10.17605/OSF.IO/DMVTQ). We extended the specified MSEM in Study 1 to
824 examine the proposed hypotheses. First, aversive morning commute predicted ego depletion as the
825 first-stage mediator in our model. Moreover, flow experiences—the second-stage mediator—was
826 predicted by aversive morning commute and the satisfaction of all three needs on the within-person
827 level. The proposed moderating effects of impulse control demands, and daily satisfaction of each
828 basic need were examined by specifying the two-way interactions of ‘ego depletion×impulse

829 control demands, ego depletion×basic needs satisfaction’, and ‘impulse control×basic needs
830 satisfaction’ as well as the three-way interactions (ego depletion×impulse control demands×basic
831 needs satisfaction) to predict flow experiences. Finally, we specified paths from ego depletion, flow
832 experiences, and aversive morning commute to our outcomes work engagement, subjective
833 performance, and OCB-I.

834 As in Study 1, we applied residual centering on an item level to orthogonalize each need
835 from the other two needs. Accordingly, we specified three models to prevent double
836 orthogonalization (Geldhof et al., 2013). This means that we applied residual centering to
837 autonomy, competence, and relatedness need satisfaction respectively in Model 1, 2, and 3. In
838 each model, the raw (i.e., non-residually centered) scores of the remaining two needs were
839 added. To account for their potential confounding effects, we added morning commute time,
840 negative affect, and tension as controls to predict all endogenous variables in our model.
841 Following suggestions by Hofmann and Gavin (1998) and Ohly et al. (2010), we applied person-
842 mean centering to all exogenous variables in our model. We used the Monte Carlo approach of
843 re-sampling described in Study 1 to estimate the confidence intervals for the conditional indirect
844 effects (Preacher & Selig, 2012).

845 **Results**

846 The descriptive statistics, internal consistencies, and correlations among all variables of
847 Study 2 are presented in Table 4.

848 Before testing our hypotheses, we examined the within- and between-person variation in
849 all study variables. The relatively high proportions of within-person variance for aversive
850 morning commute (60.7%), ego depletion (57.2%), flow experiences (42.4%), impulse control
851 demands (38.1%), autonomy (25.5%), competence (27.0%), and relatedness (22.5%) need

852 satisfaction, work engagement (34.0%), subjective performance (44.1%), and OCB-I (26.9%)
853 justify the application of multilevel analyses.

854 The MSEM results are presented in Table 5. As in Study 1 for the effects that do not
855 differ between the three models, we will exemplarily present the results of Model 1. In line with
856 our predictions there was a positive relationship between day-specific aversive morning
857 commute and ego depletion ($\gamma = .19, p < .01$), and a negative relation between ego depletion and
858 flow experiences ($\gamma = -.28, p < .01$) also when controlling for negative affect ($\gamma = .01, p = .93$)
859 and tension ($\gamma = -.11, p = .24$) as potential alternative mechanisms. Finally, flow experiences
860 were positively related to all three outcomes (work engagement: $\gamma = .30$; subjective performance:
861 $\gamma = .19$; OCB-I: $\gamma = .14$; all p 's $< .01$).

862 Hypothesis 4 suggests an indirect effect of aversive morning commute on work
863 engagement, subjective performance, and OCB-I through increased ego depletion and reduced
864 flow experiences at work. In support of Hypothesis 4 a-c, the 95% CIs for the serial mediation
865 through ego depletion and flow experience on all outcomes at mean levels of impulse control
866 demands as well as autonomy, competence, and relatedness needs satisfaction did not include
867 zero (cf. Table 6).

868 Hypothesis 5 proposes a moderated mediation in which day-specific impulse control
869 demands and (a) autonomy, (b) competence, and (c) relatedness need satisfaction moderate the
870 indirect effects of aversive morning commute on all three outcomes. Out of the proposed three-
871 way interactions, only the three-way interaction for residual centered competence need
872 satisfaction (i.e., ego depletion \times IC \times NSC) was significantly related to flow experiences (Model 2:
873 $\gamma = .27, p = .02$), thus providing support for Hypothesis 5b but nor for Hypotheses 5a and 5c.

874 As in Study 1, we plotted the three-way interaction to examine whether its pattern
875 corresponds with Hypothesis 5b and examined simple slopes as well as slope differences

876 (Dawson & Richter, 2006) at values of 1 *SD* above and below the mean for both moderators (i.e.,
877 impulse control demands, and competence need satisfaction). The pattern of the three-way
878 interaction corresponds with our proposition. More specifically, slope difference tests indicate
879 that there is no significant two-way interaction between ego depletion and impulse control
880 demands on days with high competence need satisfaction (Model 2: slope difference between
881 low and high impulse control demands = 0.08, $t = 0.70$, $p = .48$). In contrast, on days with low
882 competence need satisfaction there is a marginally significant two-way interaction between ego
883 depletion and impulse control demands (slope difference between low and high impulse control
884 demands = -0.18, $t = -1.84$, $p = .07$).

885 Further testing the hypothesized moderated mediation proposed in Hypothesis 5b, we
886 computed 95% CIs for the indirect effects for all combinations of competence need satisfaction
887 (high vs. low) and impulse control demands (high vs. low) on all three outcomes. Our results
888 indicate that for all combinations of competence need satisfaction and impulse control demands
889 there was an indirect effects of aversive morning commute through ego depletion and flow
890 experience on each outcome as indicated by all corresponding 95% CIs including zero (cf. Table
891 6). In support of Hypothesis 5b pairwise comparisons of the differences in conditional indirect
892 effects indicated that on days with high competence need satisfaction, there were no differences
893 in indirect effects between high and low levels of daily impulse control demands (Model 2: Work
894 engagement: $\gamma = .01$, $p = .46$; 95% CI [-.008, .019]; Model 2: Subjective performance: $\gamma = .00$, p
895 = .46; 95% CI [-.005, .014]; Model 2: OCB-I: $\gamma = .00$, $p = .47$; 95% CI [-.004, .009]) whereas on
896 days when competence need satisfaction was low there was a marginally significant ($p < .10$)
897 difference in indirect effects for days with high as compared to low impulse control demands for
898 all outcomes (work engagement: $\gamma = -.01$, $p = .06$; 90% CI [-.022, -.001]; subjective performance:
899 $\gamma = -.01$, $p = .06$; 90% CI [-.015, -.001]; OCB-I: $\gamma = -.01$, $p = .07$; 90% CI [-.012, -.001]).

900 Finally, the amounts of explained within-person variance for all endogenous variables in
901 our model were 18.4% for ego depletion, 8.9% for flow experiences, and 36.0% for work
902 engagement: 22.2% for subjective performance, and 7.7% for OCB-I. Thus, considering that
903 various influences on work-related effectiveness outcomes exist, our models still account for
904 relevant amounts of variability in endogenous variables.

905 *Additional Analyses*

906 We conducted the same additional analyses as in Study 1 to test the robustness of our
907 findings. First, we examined the impact of previous day dependent variables and specified the
908 same variable measured on the previous day as a predictor for each dependent variable on the
909 within-person level. Moreover, we controlled for cyclical effects by adding day, sine of the day,
910 and cosine of the day to predict all dependent variables. The results of these analyses
911 demonstrate that the respective previous day predictors were only significantly related to our
912 outcomes (work engagement: $\gamma = .24, p < .01$; subjective performance: $\gamma = .19, p < .01$; OCB-I: γ
913 $= .30, p < .01$). There was no evidence for cyclical effects regarding participants' responses.
914 Moreover, as in Study 1, the inclusion of previous day predictors and cyclical effects did not
915 affect the main results.

916 As in Study 1, we report observed power for the proposed effects (Bliese & Wang, 2020).
917 For the direct effects, observed power was above 80% (all t 's > 2.81 ; Bliese & Wang, 2020). For
918 the indirect effects, observed power was above 80% when predicting work engagement (post-hoc
919 power = 82.3%), whereas for subjective performance (post-hoc power = 68.3%), and OCB-I
920 (post-hoc power = 58.4%) as outcomes observed power was below 80%. Finally, for the
921 interaction effect involving daily competence need satisfaction, observed power was also below
922 80% (post-hoc power = 64.8%). In sum, the results of Study 2 largely replicate Study 1's

923 findings and observed power analyses highlight that the examined effects, for the most part,
924 should remain stable if examined in another study with the same sample size.

925 **Discussion**

926 The profound knowledge of the general adverse effects of commuting on individuals and
927 societies has not yet been matched by an equally elaborated investigation of the mechanisms and
928 boundary conditions linking daily aversive morning commutes to employee effectiveness. In line
929 with our propositions, the results of two daily diary studies support the depletion of employees'
930 regulatory resources and flow experiences as focal mechanisms underlying the adverse day-
931 specific impacts of aversive morning commutes on motivational (work engagement) and
932 behavioral (in-role and extra-role behaviors) indicators of employee effectiveness. The proposed
933 role of regulatory resources is implied by the interaction of an aversive morning commute with
934 self-control demands in predicting flow experiences in Study 1 and directly supported by the
935 sequential mediation via ego depletion in Study 2. We further tested whether the satisfaction of
936 between- and within-person differences in basic needs satisfaction can protect employees against
937 the joint overadditive depleting effects of aversive morning commutes and self-control demands.
938 Our results indicate that for more general between-person differences in needs satisfaction the
939 common features of autonomy and competence need satisfaction protect employees' flow
940 experiences and associated effectiveness from the joint depleting effects of an aversive morning
941 commute and self-control demands. For within-person differences, in needs satisfaction, our
942 research identifies that day-specific competence need satisfaction exhibits a similar protective
943 effect as between-person differences in autonomy and competence need satisfaction.

944 **Theoretical Implications**

945 Our research offers several theoretical implications. First, we specify the regulatory
946 resource loss process that links an aversive morning commute to employee effectiveness.

947 Specifically, the present research contributes to a better understanding of the link between an
948 aversive morning commute and employee effectiveness by expanding upon the role of regulatory
949 resource depletion and flow experiences as underlying mechanisms. Study 1 shows that flow
950 experiences and work engagement are related across the whole workday. Study 2 expands these
951 findings by demonstrating time-lagged relations between ego depletion after an aversive
952 commute, flow experiences, and associated employee effectiveness. From a theoretical
953 perspective, these time-lagged relations are particularly relevant because they emphasize the role
954 of flow as both a resource-demanding (Csikszentmihalyi et al., 2005; Debus et al., 2014) and
955 once reached a resource-recovering psychological state. Notably, research has mostly focused on
956 the resource-recovering function of flow, thus leaving some room for theorizing about the
957 resource-demanding nature of entering states of flow (see Sonnentag et al., 2012).

958 Second, by conceptualizing day-specific work-related self-control demands as a
959 moderator of the proposed mediation model, we provide further evidence for the overadditive
960 effects of coping with multiple self-control related stressors before and at work (van Woerkom et
961 al., 2016). Previous cross-sectional studies have demonstrated that more stable work-related self-
962 control demands interact to predict impaired well-being (Diestel & Schmidt, 2011). Our research
963 extends these findings by demonstrating that akin to the interactive effects of these general self-
964 control demands, short-term day-specific demands on self-control exhibit similar interactive
965 effects and overtax employees' regulatory resources. We develop a theoretical explanation for
966 these overadditive effects by integrating self-regulation and COR theory. In particular, the results
967 of Study 2, which demonstrate an interactive effect of ego depletion and impulse control
968 demands on flow experiences when daily competence need satisfaction is low, support our
969 theoretical reasoning that the depletion of regulatory resources is associated with the tendency to
970 conserve remaining regulatory resources. In turn, employees must invest regulatory resources not

971 only to deal with impulse control demands but also to overcome the urge to preserve regulatory
972 resources, which overtaxes their pools of regulatory resource and prevents flow experiences.
973 Thus, our research contributes to self-regulation theory by explaining why coping with multiple
974 self-control demands is “really bad” for employees’ regulatory resources (Diestel & Schmidt,
975 2011).

976 Third, our research also sheds light on the role of inter- and intraindividual differences in
977 basic needs satisfaction as buffering moderators of the interplay of ego depletion following an
978 aversive morning commute and self-control demands. In Study 1, we address the call for
979 conceptual frameworks that incorporate both day-specific and general capacities (Luthans &
980 Youseef, 2007). In Study 2, we test for homology across levels, thereby extending recent research
981 suggesting that within-person fluctuations in needs satisfaction may also play a pivotal role in
982 predicting employee effectiveness (e.g., De Gieter et al., 2018; Hewett et al., 2017; Reis et al.,
983 2000). We found support for the proposed three-way interactions of person- and day-level
984 competence need satisfaction in both studies. As such, our findings particularly highlight the
985 importance of competence need satisfaction as a general and a day-specific motivating contingency
986 that can protect employees from the joint overadditive effects of ego depletion through an aversive
987 morning commute and self-control demands. These findings strongly correspond with the
988 theoretical notion and empirical evidence that the challenge-skill balance of an activity is a crucial
989 determinant for experiencing flow (Fong et al., 2015). This balance is also a crucial characteristic
990 of high competence need satisfaction (Van den Broeck et al., 2010). Thus, the theoretical match of
991 competence need satisfaction as a moderator with flow as an outcome of the proposed three-way
992 interaction may explain the consistent moderating effects of competence needs satisfaction across
993 levels found in both studies (see also De Jonge & Dorman, 2006).

994 Study 1 also supported the moderating effect of person-level autonomy need satisfaction,

995 whereas there was no corresponding effect in Study 2. However, our findings also indicate that not
996 the unique proportions of variance of autonomy or competence needs satisfaction (i.e., obtained
997 through orthogonalizing each need from the remaining two needs) accounts for the proposed
998 buffering effect but rather the shared variance among the autonomy and competence needs
999 satisfaction variables. This interpretation is also supported by the corresponding patterns of the
1000 three-way interaction effects for autonomy and competence needs satisfaction in Study 1 as well
1001 as the fact that these interaction effects only become significant once the collinearity between
1002 these needs is removed from the model through residual centering. In other words, the protective
1003 function of both needs results from the high overlap of these needs on the between-person level.
1004 The differential evidence for the three-way interaction of autonomy need satisfaction on the
1005 between- as compared to the within-person level highlights that despite convincing theoretical
1006 arguments for homologous effects, it is still important to empirically test such effects (Chen et al.,
1007 2005). A theoretical explanation for the relative importance of general rather than short-term day-
1008 specific autonomy need satisfaction could lie in the ambivalent resource-related role of autonomy
1009 satisfaction on the day-level. A high level of daily autonomy need satisfaction means that
1010 compared to the employee's mean level of autonomy need satisfaction, an employee feels more
1011 autonomous at work on that day. This above-average level of autonomy entails that the employee
1012 may not have automatic scripts for deciding how to work on that day, meaning they need to make
1013 conscious decisions to organize, and implement tasks. Accordingly, they may not benefit from
1014 additional regulatory resources provided by autonomy need satisfaction. A high level of general
1015 autonomy need satisfaction, in contrast, means that employees regularly perceive they can do their
1016 work the way they deem best, thus allowing them to develop automated scripts for making most
1017 use of the autonomy they have. Hence, they make better use of the autonomy to conduct their work

1018 with self-developed routines that they feel work best for their resource levels, thus leaving them
1019 with a more fueled resource pool than their counterparts who experience less autonomy need
1020 satisfaction. This argument is supported by theorizing on the double meaning of job control which
1021 outlines that high control is only beneficial for those who can handle it (Meier et al., 2008).

1022 Neither person- nor day-level relatedness need satisfaction moderated the proposed
1023 relationships. This points to a higher relevance of cognitive aspects of motivation rather than a
1024 more general resource recovering function of basic needs satisfaction for experiencing flow at
1025 work in the face of demands that deplete regulatory resources. In line with this notion, cognitive
1026 evaluation theory—a sub-theory of self-determination theory (Deci & Ryan, 1985)—has focused
1027 on autonomy and competence needs satisfaction as key psychological constructs to explain why
1028 some people find it easier to experience flow (Abuhamdeh, 2012; Kowal & Fortier, 1999). It is
1029 conceivable, however, that the protecting role of relatedness need satisfaction in the face of
1030 overadditive demands for experiencing flow foremost applies in situations where work involves
1031 social interactions (e.g., teamwork, customer contact). Accordingly, the three-way interaction for
1032 relatedness need satisfaction may be more likely to manifest in environments in which work
1033 requires interacting with others. As our study did not account for this contextual variable, future
1034 theorizing may consider it to clarify the motivational function of relatedness need satisfaction.

1035 **Limitations and Future Research**

1036 This research is not without limitations that may inform future research. First, our
1037 findings may have been influenced by the studies' context. The conditions of commuting in
1038 Germany and the UK are comparable to many countries in Europe and North America, implying
1039 that our results may be generalizable to these regions. However, while most commuters in the US
1040 (Desjardins, 2018) and in Germany (Federal Statistical Office Germany, 2017) take less than 30

1041 minutes to commute from home to work, conditions are more challenging in many Asian
1042 countries. For example, the average commuting time in Beijing (China) is 52 minutes (World
1043 Economic Forum, 2017). Future research could investigate whether more challenging journeys to
1044 work are associated with even stronger impaired employee effectiveness. Relatedly, ethnicity
1045 (which we did not assess) and cultural norms for commuting may also influence these effects.

1046 Second, we did not sample enough active commuters who cycled or walked to work to
1047 compare the motivational consequences of different types of commuting. Adam et al.'s research
1048 (2018) suggests that active commuting is more enjoyable than passive commuting (e.g., driving by
1049 car, going by public transport). Furthermore, evidence from multi-wave studies suggests that active
1050 commuting is less resource depleting and may even restore resources (Martin et al., 2014) and that
1051 it has positive effects on physiological fitness (Blond et al., 2019). Yet, to our knowledge, no diary
1052 study has so far investigated whether the mode of transport influences perceptions of day-specific
1053 commutes and how this in turn relates to employees' motivational states and behaviors. Exploring
1054 the unique effects of active versus passive commuting, a future within-person field experiment
1055 (Michiels & Onghena, 2019) may ask people to switch between active and passive modes of
1056 transport on different days. Relatedly, future research could explore the impact of teleworking,
1057 which renders commuting obsolete, on employees' day-specific flow experiences and associated
1058 effectiveness. In fact, the COVID-19 pandemic has forced many employees to suddenly work from
1059 home and stop commuting. We hope to see research that compares this exogenously induced "no-
1060 commute" situation with the subsequent situation (i.e., people commuting to work again). On the
1061 one hand, initial evidence indicates that no commute is not a satisfying solution either (Humagain
1062 & Singleton, 2020), as it makes it more difficult for people to separate home and work
1063 (Jachimowicz et al., in press). On the other hand, commuting in the context of the COVID-19
1064 pandemic may be even more depleting, as it is associated with additional self-control demands

1065 (e.g., wearing a mask, inhibiting the urge to touch one's face, controlling impulsive reactions
1066 toward others who are not adhering to social distancing guidelines). To conclude, disentangling the
1067 commute experience is a promising area for future research (Calderwood & Mitropoulos, 2020).

1068 Third, to avoid additional confounding factors, we did not include shift workers in our
1069 studies. However, commuting at variable times (i.e., due to varying shift work) may be an
1070 additional contingency that warrants further investigation. As we initially outline, due to its
1071 recurring nature, for most employees commuting predominantly relies on automatic cognitive
1072 processing (Elfering et al., 2013), which is efficient in its consumption of regulatory resources
1073 (Baumeister et al., 2000). Indeed, transportation research (e.g., Chang & Mahmassani, 1988;
1074 Mahmassani, 1990; Mahmassani & Tong, 1986) shows that individuals gain experience with
1075 their route to work and become experts at estimating the best departure time with the goal to
1076 arrive on time (i.e., neither too early nor too late). However, commuting at different times should
1077 prevent forming commuting habits and an accurate estimation of optimal commuting times is
1078 much more difficult for shift workers because their commuting time varies (Nogland & Small,
1079 1995). The commute of shift as compared to non-shift workers thus requires more controlled
1080 cognitive processing such as planning, monitoring the progress, and adapting the commute if
1081 necessary. To summarize, diving deeper into unusual commuting times could be a valuable
1082 extension of our model.

1083 Lastly, a promising endeavor would be to extend our conceptual framework by zooming
1084 into positive commute experiences. Similar to the argument in the positive and negative
1085 affectivity literature (Cropanzano et al., 2003; Watson et al., 1999), the absence of a negative
1086 commute experience does not equal a positive commute experience. The latter refers to a
1087 stimulating activity that can come into place, for example, through inspiring conversations with
1088 one's co-workers on the way to work or by transitioning into one's work role by planning the

1089 workday (Jachimowicz et al., in press). Such positive commute experiences may help maintain
1090 and expand regulatory resources, thereby facilitating flow experiences at work.

1091 **Practical Implications**

1092 First, our research highlights that for organizations the time is ripe to stop externalizing
1093 the costs of aversive morning commutes to individual employees or societies, but instead to
1094 explore new ways on how to reduce the negative consequences of aversive morning commutes.
1095 Organizationally determined work schedules can dictate the time frames during which employees
1096 must commute, thus making it difficult to optimize departure times to avoid high congestion
1097 (Nogland & Small, 1995). In other words, commuting is heavily determined by organizational
1098 practices (e.g., static work schedules) that often increase the likelihood of encountering
1099 unfavorable external circumstances (e.g., commuting during rush hours). An immediate
1100 intervention could be to reduce the aversiveness of the commute experience by providing
1101 flexible work schedules. This would allow employees to travel off-peak and has been associated
1102 with improved physical and mental health as well as higher productivity (VitalityHealth, 2017).

1103 Second, organizations might consider that high competence need satisfaction protects
1104 employees from the joint adverse consequences of an aversive morning commute and self-
1105 control demands. Thus, a reasonable implication is to increase employees' general, as well as
1106 daily competence need satisfaction. Promising approaches to improve general levels of
1107 competence need satisfaction are, for example, interventions to enhance employees' work-related
1108 skills (Ryan & Deci, in press) or to equip them with strategies to increase their perceived
1109 competence despite high work demands (Weigelt et al., 2018). On a daily level, managers with a
1110 good knowledge of their employees' skillsets could assign tasks appropriate for their employees'
1111 skill levels and offer support for challenging work tasks (Van den Broeck et al., 2016).

1112 Third, turning to a broader level of policy implications, governments can play a pivotal role

1113 in reducing aversive commute experiences. Since delays are among the most prevalent aversive
1114 commute experiences (Gatersleben & Uzzell, 2007), investments in infrastructure (e.g., intelligent
1115 traffic lights, automatic speed limits) and public transport (e.g., more trains, networks optimized by
1116 machine learning approaches) could reduce aversive commutes. Further, policy decisions can help
1117 change people's preferred ways of commuting, thus leading to a potentially more balanced
1118 capacity utilization. For example, research has shown that investment in safe cycling lanes
1119 increases the number of people who cycle to work (Pucher & Buehler, 2017).

1120 Finally, societal beliefs and norms about work-/life spaces also play a role in determining
1121 how we commute. For many decades, architects separated the space for work, life, and recreation
1122 (De Jong & Schuilenburg, 2006). While this improved unhygienic living conditions in the past,
1123 today's higher production standards have made this function obsolete in many countries. Instead,
1124 increases in property prices in city centers cause both employees and organizations to move to
1125 more rural areas increasing commuting duration (Ingraham, 2017; Zhu et al., 2017). Rethinking
1126 the integration of work and life spheres is thus a question for our communities and policymakers
1127 alike. In that regard, it is possible that the recent shift toward "working from home" due to the
1128 COVID-19 pandemic results in a reconsideration of how we separate work and life.

1129 **Conclusion**

1130 Although commuting is an everyday experience for everyone who works outside the
1131 home, its dynamic nature and implications for daily life in organizations have been largely
1132 overlooked. We provided a conceptual framework outlining the motivational consequences of an
1133 aversive commute from a self-regulatory resource perspective and explored work-related basic
1134 needs satisfaction as resilience factors against its adverse effects. We hope that our work inspires
1135 scholars and practitioners alike to engage in a constructive dialogue to help employees to
1136 smoothly flow to work so that they can experience more flow at work.

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Table 1. MCFA Results (Study 1 and Study 2)

	χ^2	df	RMSEA	CFI	SRMR between	SRMR within	S-B scaled χ^2 to Model 1	Δ df	p
Study 1									
Model 1: 3-Factors-Between , 4- Factors-Within	1053.97	395	.064	.914	.096	.059			
Model 2: 3-Factors-Between, 3- Factors-Within (Flow and work engagement as a single factor)	2089.59	398	.102	.780	.096	.090	1415.75	3	.000
Model 3: 1-Factor-Between (Basic needs satisfaction as a single factor), 4- Factors-Within	1146.810	398	.068	.903	.160	.059	681.730	3	.000
Model 4: 1-Factor-Between, 1-Factor-Within	4568.520	404	.158	.458	.160	.178	8263.710	9	.000
Study 2									
Model 1: 12-Factors-Within	4430.41	1824	.045	.904		.046			
Model 2: 10-Factors-Within (Basic needs satisfaction as a single factor)	6825.44	1845	.061	.816		.061	4245.89	21	.000
Model 3: 10-Factors-Within (Ego depletion, tension, and negative affect as a single factor)	6571.28	1845	.060	.826		.074	941.43	21	.000
Model 4: 10-Factors-Within (Work engagement, subjective performance, and OCB-I as a single factor)	6449.27	1845	.059	.830		.067	1079.27	21	.000

Note. df = Degrees of freedom, RMSEA= Root Mean Square Error of Approximation, CFI = comparative fit index, SRMR = Standardized Root Mean Square Residual, S-B = Satorra-Bentler

Table 2. Means, Standard Deviations, and Intercorrelations (Study 1)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Aversive morning commute - morning	-	-0.20	0.02	-0.09	0.38							
2. Flow experience - afternoon	-0.26	-	-0.26	0.49	-0.04							
3. Impulse control demands - afternoon	0.10	-0.26	-	-0.15	-0.06							
4. Work engagement - evening	-0.12	0.77	-0.22	-	0.09							
5. Commute time - morning (in minutes)	0.48	-0.27	-0.02	-0.10	-							
6. <i>Basic need satisfaction - autonomy</i>	-0.07	0.53	-0.25	0.65	-0.14	-						
7. <i>Basic need satisfaction - competence</i>	-0.03	0.63	-0.30	0.61	0.03	0.70	-					
8. <i>Basic need satisfaction - relatedness</i>	-0.03	0.26	-0.19	0.29	-0.24	0.44	0.21	-				
9. Age	-0.16	0.26	-0.11	0.13	-0.09	0.08	0.07	-				
10. Gender ^a	-0.20	0.04	-0.08	0.08	0.16	0.03	0.25	-0.24	-			
11. Leadership position ^b	0.08	-0.20	0.10	-0.31	-0.02	-0.41	-0.41	-0.27	-0.40	-		
12. Distance to work (in km)	0.10	-0.09	0.01	-0.10	0.56	0.02	0.24	-0.05	0.00	0.25	-	
M	2.47	5.08	2.45	4.01	32.74	3.83	3.91	4.05	38.00	1.43	1.75	19.40
SD	0.90	0.85	0.99	1.45	23.88	0.98	0.78	0.84	13.51	0.50	0.43	21.86

Note. ^aGender (1 = female, 2 = male). ^bLeadership position (1 = yes, 2 = no). Correlations below the diagonal represent person-level correlations ($N = 53$).

Correlations above the diagonal are day-level correlations ($N = 411$). Person-level variables in italic. Numbers in bold $p < .05$.

Table 3. MSEM Results and Within-Person Conditional Indirect Effects of Aversive Morning Commute via Flow Experiences on Work Engagement (Study 1)

	Model 1: Residual centered autonomy need satisfaction				Model 2: Residual centered competence need satisfaction				Model 3: Residual centered relatedness need satisfaction			
	Flow experience (FE)		Work engagement (WE)		Flow experience (FE)		Work engagement (WE)		Flow experience (FE)		Work engagement (WE)	
<i>Between-person direct effects</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>
Intercept	5.165 (.125)	.000	3.891 (.193)	.000	5.169 (.129)	.000	3.892 (.194)	.000	5.163 (.129)	.000	3.888 (.193)	.000
Basic need satisfaction - autonomy (NSA)	-.119 (.158)	.454			.092 (.129)	.476			-.141 (.136)	.302		
Basic need satisfaction - competence (NSC)	.298 (.121)	.014			.473 (.146)	.001			.400 (.135)	.003		
Basic need satisfaction - relatedness (NSR)	.009 (.107)	.935			.014 (.116)	.905			.062 (.134)	.643		
Residual variance	.496 (.127)	.000	1.669 (.299)	.000	.492 (.141)	.000	1.665 (.298)	.000	.521 (.137)	.000	1.671 (.300)	.000
<i>Within-person direct effects</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>
Commute time	-.002 (.002)	.118	.007 (.002)	.001	-.003 (.002)	.173	.007 (.002)	.000	-.002 (.002)	.152	.007 (.002)	.001
Aversive morning commute (AC)	-.153 (.050)	.002	-.043 (.043)	.325	-.171 (.054)	.001	-.043 (.043)	.318	-.157 (.051)	.002	-.043 (.043)	.320
Impulse control demands (IC)	-.259 (.067)	.000			-.254 (.067)	.000			-.251 (.067)	.000		
AC x IC	-.231 (.101)	.022			-.253 (.095)	.008			-.223 (.102)	.029		
AC x NSA	.074 (.108)	.494			.132 (.043)	.002			.010 (.078)	.898		
IC x NSA	-.216 (.152)	.154			-.058 (.078)	.455			-.074 (.103)	.471		
AC x IC x NSA	.002 (.212)	.991			.173 (.079)	.029			.042 (.156)	.788		
AC x NSC	.216 (.078)	.006			.241 (.149)	.107			.219 (.134)	.102		
IC x NSC	.036 (.076)	.634			.147 (.129)	.254			.122 (.119)	.304		
AC x IC x NSC	.253 (.103)	.015			.198 (.225)	.379			.202 (.208)	.331		
AC x NSR	.008 (.051)	.882			-.007 (.053)	.893			-.020 (.059)	.733		
IC x NSR	.103 (.072)	.155			.140 (.080)	.080			.203 (.089)	.022		
AC x IC x NSR	.012 (.093)	.896			-.026 (.099)	.795			-.031 (.110)	.778		
Flow experience (FE)			.483 (.062)	.000			.483 (.062)	.000			.483 (.062)	.000
Residual variance	.341 (.068)	.000	.374 (.041)	.000	.346 (.070)	.000	.374 (.041)	.000	.341 (.068)	.000	.374 (.041)	.000
<i>Within-person conditional indirect effects</i>									Estimate (SE)	<i>p</i>	LLCI	ULCI
Model 1: AC → FE → WE (Mean NSC, Mean IC)									-.074 (.026)	.002	-.1290	-.0252
Model 1: AC → FE → WE (Mean NSC, High IC)									-.145 (.045)	.001	-.2386	-.0610
Model 1: AC → FE → WE (Mean NSC, Low IC)									-.003 (.037)	.947	-.0773	.0680
Model 1: AC → FE → WE (High NSC, High IC)									-.007 (.062)	.937	-.1340	.1110
Model 1: AC → FE → WE (High NSC, Low IC)									.017 (.030)	.563	-.0426	.0768
Model 1: AC → FE → WE (Low NSC, High IC)									-.283 (.069)	.000	-.4234	-.1531
Model 1: AC → FE → WE (Low NSC, Low IC)									-.024 (.052)	.658	-.1292	.0759
Model 2: AC → FE → WE (High NSA, High IC)									-.046 (.051)	.355	-.1475	.0534
Model 2: AC → FE → WE (High NSA, Low IC)									.006 (.054)	.920	-.0993	.1142
Model 2: AC → FE → WE (Low NSA, High IC)									-.272 (.054)	.000	-.3824	-.1721
Model 2: AC → FE → WE (Low NSA, Low IC)									-.015 (.044)	.746	-.1056	.0675

Note. $N_{between} = 53$; $N_{within} = 411$; *SE* = standard error; *LLCI* = lower-level confidence interval (95%); *ULCI* = upper-level confidence interval (95%). In each model, all effects were included simultaneously to predict flow experiences and work engagement. Confidence intervals, which do not include zero, are marked in bold; 95% confidence intervals for parameter estimates of the direct effects are available upon request.

Table 4. Means, Standard Deviations, and Intercorrelations (Study 2)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Aversive morning commute - morning	-	0.19	0.09	0.15	-0.06	0.01	-0.01	0.04	-0.02	-0.10	-0.07	-0.08	0.34				
2. Ego depletion - morning	0.33	-	0.38	0.36	-0.33	0.01	-0.10	-0.13	-0.07	-0.29	-0.12	-0.11	-0.03				
3. Negative affect - morning	0.29	0.46	-	0.75	-0.16	0.03	-0.03	-0.04	-0.02	-0.18	-0.07	0.04	0.03				
4. Tension - morning	0.29	0.44	0.96	-	-0.21	0.09	-0.09	-0.14	-0.08	-0.23	-0.07	0.05	0.04				
5. Flow experience - afternoon	-0.29	-0.59	-0.25	-0.27	-	-0.06	0.28	0.37	0.21	0.39	0.19	0.15	0.03				
6. Impulse control demands - afternoon	0.31	0.30	0.30	0.34	-0.15	-	-0.09	0.01	-0.16	-0.10	-0.06	0.01	-0.01				
7. Basic need satisfaction - autonomy - afternoon	-0.27	-0.37	-0.19	-0.19	0.60	-0.32	-	0.39	0.21	0.22	0.07	0.02	-0.03				
8. Basic need satisfaction - competence - afternoon	-0.23	-0.45	-0.34	-0.37	0.74	-0.16	0.55	-	0.21	0.25	0.25	0.13	0.05				
9. Basic need satisfaction - relatedness - afternoon	-0.23	-0.29	-0.23	-0.28	0.59	-0.26	0.63	0.53	-	0.20	0.14	0.08	0.00				
10. Work engagement - evening	-0.32	-0.51	-0.27	-0.28	0.77	-0.13	0.55	0.52	0.49	-	0.46	0.26	-0.03				
11. Subjective performance - evening	-0.27	-0.41	-0.30	-0.31	0.72	-0.06	0.42	0.76	0.43	0.64	-	0.25	0.00				
12. OCB - I - evening	-0.13	-0.15	-0.24	-0.27	0.37	-0.03	0.38	0.36	0.67	0.42	0.34	-	-0.05				
13. Commute time - morning (in minutes)	0.20	0.14	0.14	0.16	-0.19	0.13	-0.09	-0.23	-0.08	-0.11	-0.28	-0.02	-				
14. Age	-0.16	-0.14	0.00	-0.05	0.17	0.10	0.04	0.15	-0.03	0.13	0.17	-0.05	-0.01	-			
15. Gender ^a	-0.08	-0.08	0.12	0.11	-0.04	-0.12	0.02	-0.13	-0.27	0.05	-0.08	-0.34	0.19	0.19	-		
16. Leadership position ^b	0.07	0.09	0.18	0.13	-0.07	0.04	-0.18	-0.21	0.00	-0.07	-0.04	-0.11	0.04	-0.02	-0.01	-	
17. Distance to work (in miles)	0.00	0.04	-0.04	-0.01	-0.17	0.05	0.04	-0.11	-0.07	-0.01	-0.19	-0.02	0.61	0.12	0.24	-0.06	-
M	2.31	1.76	1.22	1.29	5.13	2.06	4.03	4.16	3.63	3.79	5.92	4.29	32.96	36.70	1.33	1.51	9.77
SD	0.55	0.61	0.44	0.51	0.86	1.00	0.81	0.69	0.98	0.94	0.93	1.12	23.99	10.42	0.47	0.50	10.91

Note. ^aGender (1 = female, 2 = male). ^bLeadership position (1 = yes, 2 = no). Correlations below the diagonal are person-level correlations ($N = 91$). Correlations above the diagonal are day-level correlations ($N = 719$). Person-level variables in italic. Numbers in bold $p < .05$.

Table 5. *MSEM Results (Study 2)*

	Ego depletion	Model 1: Flow experience		Model 2: Flow experience		Model 3: Flow experience		Work engagement		Subjective performance		OCB - I	
	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	Estimate (SE) <i>p</i>	
Between-person direct effects													
Intercept		5.127 (.089) .000	5.125 (.089) .000	5.128 (.089) .000	3.795 (.099) .000	5.944 (.093) .000	4.295 (.115) .000						
Residual variance		.659 (.106) .000	.662 (.106) .000	.658 (.106) .000	.833 (.139) .000	.715 (.112) .000	1.142 (.159) .000						
Within-person direct effects													
Commute time (in minutes)	-.006 (.002) .000	.001 (.002) .580	.001 (.002) .542	.001 (.002) .589	-.002 (.001) .255	.001 (.002) .782	-.003 (.002) .189						
Negative Affect	.543 (.187) .004	.011 (.117) .925	.003 (.116) .978	.009 (.116) .941	.032 (.104) .754	-.080 (.155) .606	.069 (.138) .619						
Tension	.262 (.125) .036	-.111 (.095) .241	-.109 (.094) .244	-.108 (.096) .261	-.196 (.085) .021	.040 (.124) .750	.185 (.124) .135						
Aversive morning commute	.187 (.053) .000	-.016 (.041) .695	-.009 (.041) .827	-.018 (.041) .662	-.036 (.045) .431	-.069 (.062) .272	-.059 (.045) .187						
Ego Depletion (EG)		-.279 (.042) .000	-.279 (.043) .000	-.278 (.042) .000	-.149 (.051) .003	-.049 (.066) .460	-.103 (.056) .066						
Flow experience					.303 (.045) .000	.192 (.050) .000	.138 (.049) .005						
Impulse control demands (IC)		-.022 (.036) .547	-.016 (.035) .660	-.021 (.036) .551									
Basic need satisfaction - autonomy (NSA)		.120 (.083) .149	.265 (.076) .001	.141 (.084) .093									
Basic need satisfaction - competence (NSC)		.529 (.084) .000	.493 (.089) .000	.510 (.089) .000									
Basic need satisfaction - relatedness (NSR)		.162 (.056) .004	.200 (.055) .000	.146 (.056) .010									
EG x IC		-.038 (.062) .535	-.035 (.063) .580	-.038 (.063) .545									
EG x NSA		.174 (.126) .167	.197 (.116) .088	.137 (.118) .245									
IC x NSA		.191 (.069) .006	.154 (.065) .018	.184 (.069) .008									
EG x IC x NSA		-.052 (.086) .544	.029 (.104) .778	-.061 (.087) .479									
EG x NSC		.092 (.115) .424	-.029 (.123) .812	-.041 (.124) .741									
IC x NSC		-.053 (.128) .678	-.101 (.137) .460	-.118 (.130) .365									
EG x IC x NSC		.196 (.121) .105	.266 (.114) .019	.212 (.108) .050									
EG x NSR		-.302 (.093) .001	-.322 (.098) .001	-.328 (.101) .001									
IC x NSR		.047 (.055) .395	.006 (.045) .900	.031 (.055) .575									
EG x IC x NSR		-.055 (.109) .615	-.035 (.107) .742	-.042 (.114) .710									
Residual Variance	.299 (.028) .000	.335 (.030) .000	.335 (.029) .000	.336 (.030) .000	.346 (.035) .000	.550 (.112) .000	.406 (.054) .000						

Note. *SE* = standard error; $N_{between} = 91$; $N_{within} = 719$. In each model, all effects were included simultaneously to predict all endogenous variables. In Model 1 residual centering was applied to autonomy need satisfaction, in Model 2 to competence need satisfaction and in Model 3 to relatedness need satisfaction. Except for the estimates predicting flow experiences, all other estimates were identical across all three tested models. 95% confidence intervals for parameter estimates of the direct effects are available upon request.

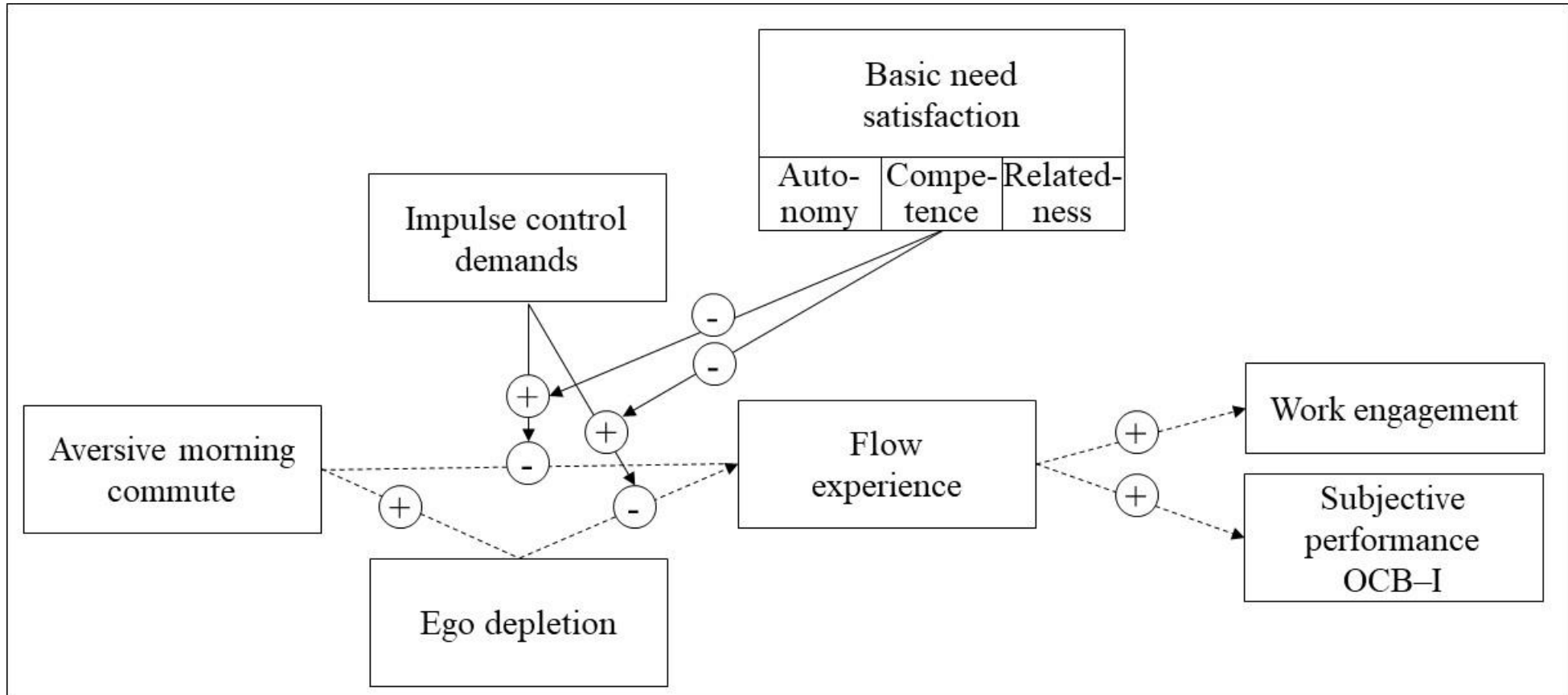
Table 6. *Within-Person Conditional Indirect Effects of Aversive Morning Commute via Ego Depletion and Flow Experience on Work Engagement, Subjective Performance, and OCB-I (Study 2).*

		Basic needs satisfaction				
				Mean		
Impulse control demands				Mean		
Outcome		Estimate (SE)	<i>p</i>	LLCI	ULCI	
Work engagement		-.016 (.005)	.000	-.0277	-.0064	
Subjective performance		-.010 (.004)	.000	-.0193	-.0033	
OCB-I		-.007 (.003)	.005	-.0146	-.0018	

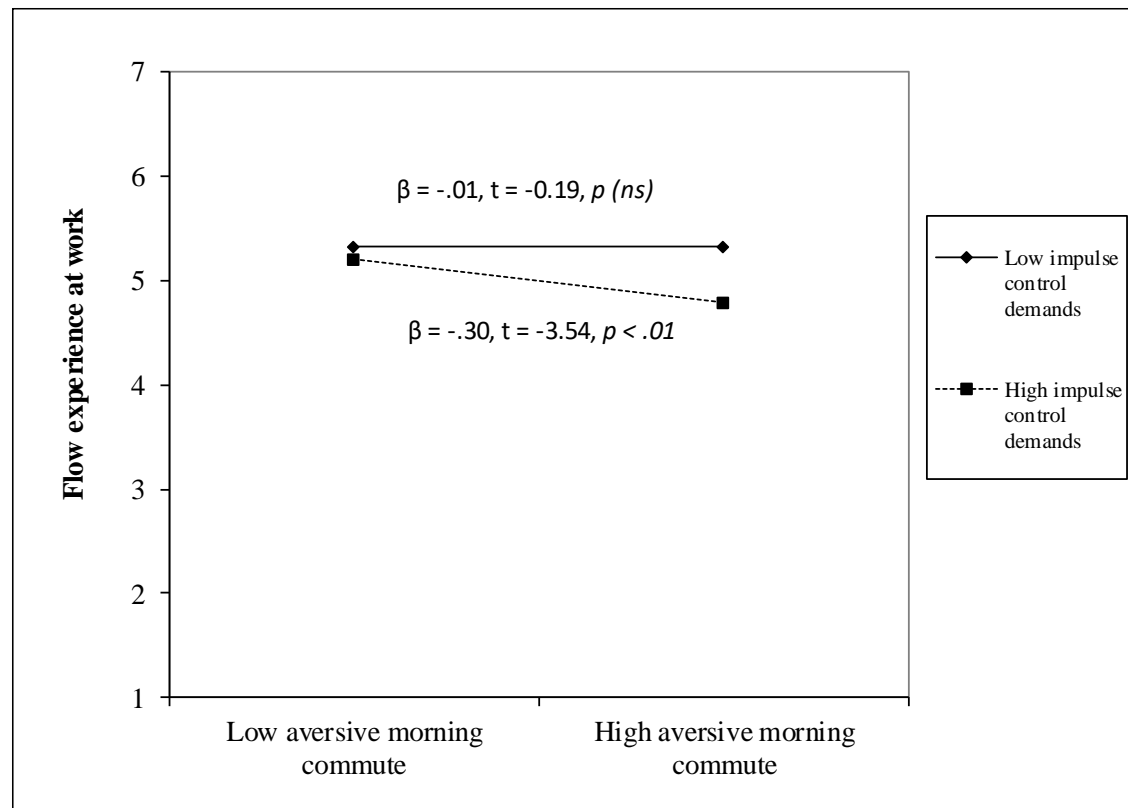
		Basic need satisfaction - competence															
		High						Low									
Impulse control demands		High		Low		High		Low		High		Low					
Outcome		Estimate (SE)	<i>p</i>	LLCI	ULCI	Estimate (SE)	<i>p</i>	LLCI	ULCI	Estimate (SE)	<i>p</i>	LLCI	ULCI	Estimate (SE)	<i>p</i>	LLCI	ULCI
Work engagement		-.014 (.007)	.006	-.0302	-.0030	-.019 (.007)	.000	-.0355	-.0065	-.020 (.008)	.000	-.0373	-.0076	-.010 (.005)	.013	-.0218	-.0017
Subjective performance		-.009 (.005)	.007	-.0199	-.0018	-.012 (.006)	.000	-.0252	-.0034	-.013 (.006)	.000	-.0259	-.0040	-.006 (.004)	.014	-.0153	-.0010
OCB-I		-.006 (.004)	.011	-.0156	-.0009	-.008 (.004)	.005	-.0182	-.0020	-.009 (.005)	.005	-.0200	-.0021	-.005 (.003)	.018	-.0107	-.0006

Note. *SE* = standard error; *LLCI* = lower-level confidence interval (95%); *ULCI* = upper-level confidence interval (95%); Confidence intervals are calculated using the Monte Carlo method for assessing mediation (MacKinnon et al., 2004); Confidence intervals which do not include zero are depicted in bold.

Figure 1. *Conceptual Model*

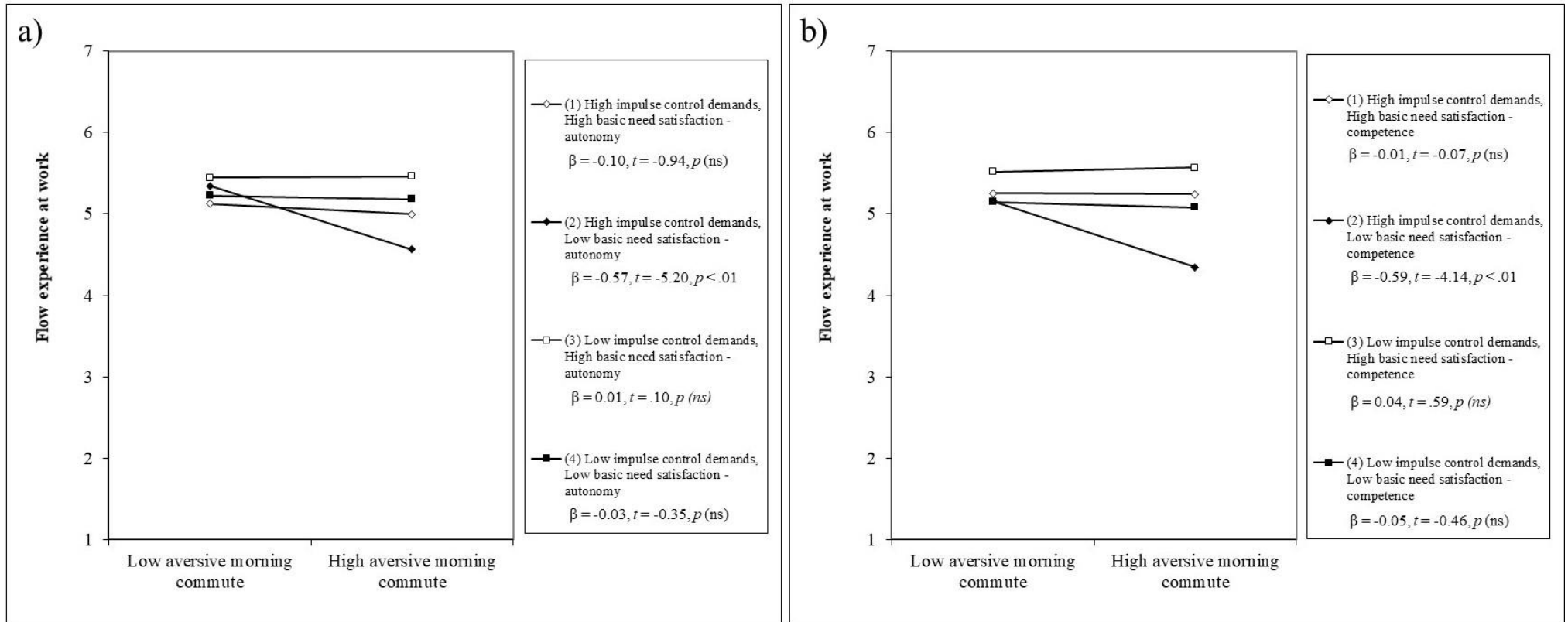


Note. Dashed lines depict indirect effects.

Figure 2. *Within-Person Interaction Effect of Aversive Morning Commute and Impulse Control Demands on Flow Experience at Work (Study 1).*

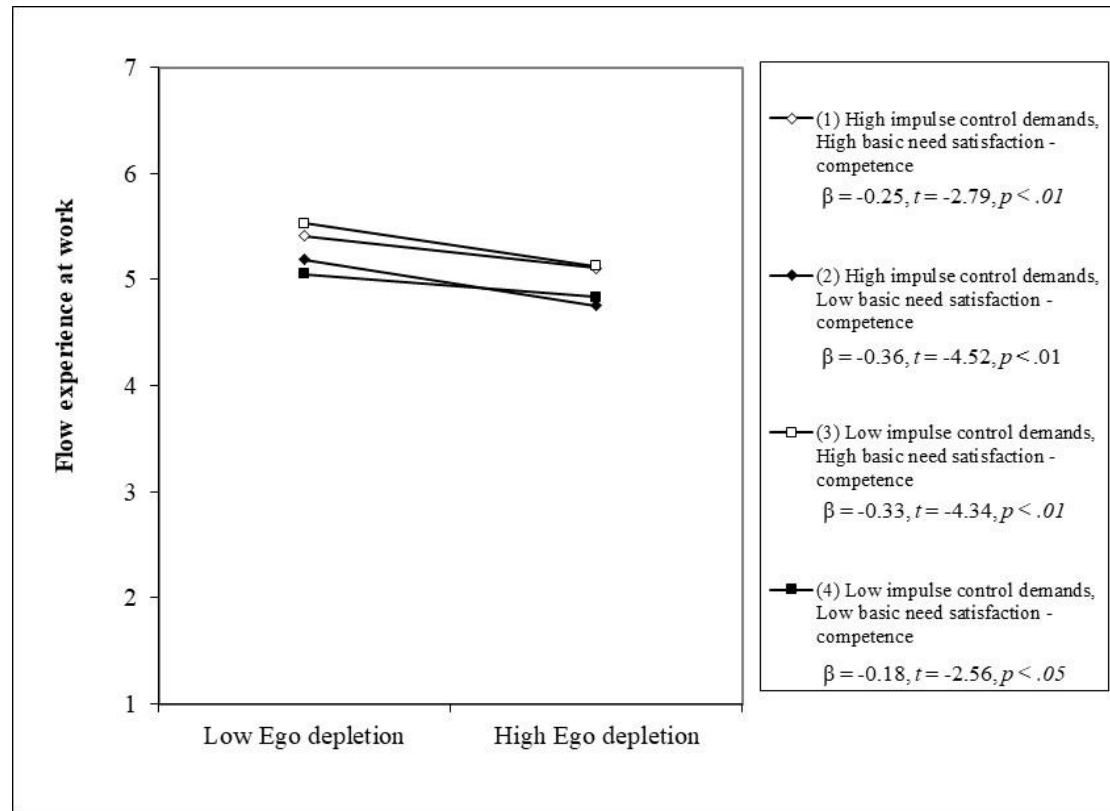
Note. The plot is based on the results of Model 1 and does not differ across all three models.

Figure 3. Cross-Level Three-Way-Interaction Effects of Aversive Morning Commute, Impulse Control Demands, and Basic Need Satisfaction for (a) Autonomy and (b) Competence on Flow Experience (Study 1)



Note. For the three-way interaction involving autonomy need satisfaction (a) plots are based on the results of Model 2 and for the three-way interaction involving competence need satisfaction (b) plots are based on the results of Model 1.

Figure 4. *Within-Person Three-Way-Interaction Effect of Ego Depletion, Impulse Control Demands, and Basic Need Satisfaction - Competence on Flow Experience (Study 2)*



Note. The plot is based on the results of Model 2.