How impulsivity shapes the interplay of impulsive and reflective processes involved in objective physical activity

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ABSTRACT

Grounded on the Reflective–Impulsive Model, a recent study by Cheval, Sarrazin, Isoard-Gautheur, Radel, and Friese (2015) found support for an interactive pattern between reflective (i.e., physical activity intentions) and impulsive (i.e., impulsive approach tendencies towards sedentary behaviors; IASB) processes to prospectively predict objective moderate to vigorous physical activity (MVPA) — strong IASB hindered reflective intentions from being executed. As low self-control is presumed to be associated with the stronger influence of impulsive processes on behavior, the present article provides a secondary analysis testing whether the interactive pattern between reflective intentions and IASB may be moderated by different facets of self-control (i.e., restraint and impulsivity). Ninety-seven adults completed a questionnaire assessing the study's variables of interest and wore an accelerometer over one week. Results revealed a moderated moderation pattern between intentions, IASB, and trait impulsivity — the previously documented interactive effect between intentions and IASB on objective MVPA was more pronounced for individuals with high as compared to low trait impulsivity. The results underline the dynamic interplay between intentions, IASB, and self-control in the determination of physical activity behavior.

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1. Introduction

Promoting regular physical activity (PA) is a public health priority, given its extensive health benefits (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010), yet there are low participation rates (Haskell et al., 2007; Sjöström, Oja, Hagströmer, Smith, & Bauman, 2006). Most social–cognitive theories assume an individual's conscious intention (e.g., "I intend to walk for at least 30 minutes, four times a week") is the most immediate and crucial predictor of behavior (see for a review Armitage & Conner, 2000). However, results of a meta-analysis of experimental evidence showed that a medium-to-large change in intention to be physically active ($d = 0.45$) produces only a small-to-medium change in behavior ($d = 0.15$; Rhodes & Dickau, 2012). Thus people do not always seem to behave in accordance with their conscious intention when they plan to do PA. Grounded on the Reflective–Impulsive Model (RIM; Strack & Deutsch, 2004) the purpose of this study was to examine the dynamic interplay between (a) a reflective precursor (i.e., intention to engage in PA), (b) impulsive precursors (i.e., approach-avoidance tendencies towards PA and sedentary

behaviors), and (c) a dispositional moderator (i.e., self-control) on objective PA behavior.

1.1. The Reflective–Impulsive Model

The RIM has been proven useful in understanding the intrapersonal dynamics underlying health behavior (e.g., Hofmann, Friese, & Wiers, 2008). The model distinguishes two separate, but interacting systems: the impulsive and the reflective that jointly guide behavior. The reflective system is based on propositional knowledge such as personal standards, explicit attitudes, and deliberate intentions. It operates through relatively slow, controlled processes, and needs psychological resources and motivation to function efficiently. By contrast, the impulsive system draws upon an associative network, operates through fast, automatic processes, and taxes resources and motivation to a much lesser extent. For example, through the repeated experience of sedentary behaviors (SB), the mere perception of an input such as seeing someone on the sofa or in front of a computer screen can lead to an impulsive tendency to approach or avoid SB.

The RIM assumes that a behavior (e.g., PA) is enacted when a specific behavioral schemata is activated above a certain threshold by the reflective and the impulsive system. When both systems activate competing behavioral schemata – for example, when the intention to go running conflicts with an impulsive tendency to watch TV – the execution of

the behavior can be impeded (Strack & Deutsch, 2004). A recent study by Cheval, Sarrazin, Isoard-Gautheur, Radel, and Friese (2015) found support for this presumed interactive pattern between reflective and impulsive precursors of PA behavior. Participants completed a computerized reaction time task assessing impulsive approach-avoidance tendencies towards PA (IAPA) and towards sedentary behaviors (IASB; (Mogg, Bradley, Field, & De Houwer, 2003) and a measure of intentions to engage in PA during the next week. Moderate-to-vigorous PA (MVPA) was objectively assessed with an accelerometer during the following week. Results revealed that MVPA was positively predicted by PA intentions and IAPA, and negatively predicted by IASB. More centrally for present purposes, the relationship between PA intentions and MVPA was moderated by IASB: intentions positively predicted MVPA, but only among participants with low or moderate, but not high, IASB (For a more detailed description of the study and the results, see Cheval et al., 2015).

1.1.1. Individual differences

Another prediction of the RIM is that dispositional moderators can shift the weight towards more impulsively or more reflectively driven behavior (Friese, Hofmann, & Schmitt, 2008; Hofmann et al., 2008). Consequently, the consideration of both reflective and impulsive precursors of behavior and dispositional moderators should further elucidate the processes underlying behavior. Two dimensions of dispositional self-control, namely trait restraint and trait impulsivity, are potential dispositional moderators identified by Hofmann et al. (2008). Trait restraint is "the ability to override or change one's inner responses, as well as to interrupt behavioral tendencies (such as impulses) and refrain from acting on them" (Tangney, Baumeister, & Boone, 2004, p. 274). Trait impulsivity refers to the same phenomenon, but from a different perspective. Whereas trait restraint focuses on control and overriding, trait impulsivity highlights different aspects of a lack of control and can be defined as "a predisposition towards rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individuals or to others" (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001, p.1784). Impulsive individuals favor immediate rewards (e.g., sedentary behaviors such as watching TV) while discounting more valuable delayed rewards (e.g., the benefits of physical exercise). As a result, individuals with high self-control (i.e., high trait restraint and/or low trait impulsivity) should be good at controlling and overriding their impulses whereas those with low self-control (i.e., low trait restraint and/or high trait impulsivity) should act on their impulses more often (Friese et al., 2008; Hofmann et al., 2008).

Recent evidence suggests that impulsive processes interact with dispositional self-control in predicting unhealthy food intake (e.g., Friese & Hofmann, 2009, study 1; Honkanen, Olsen, Verplanken, & Tuu, 2012) and self-reported alcohol consumption (Burton, Pedersen, & McCarthy, 2012; Friese & Hofmann, 2009, studies 2a and 2b). For example, Friese and Hofmann (2009) found that automatic affective reactions interacted with trait restraint (or impulsivity) in predicting the consumption of potatoes chips and self-reported alcohol consumption — behavior of individuals low in trait restraint (or high in trait impulsivity) was more strongly influenced by impulsive precursors compared with those high trait restraint (or low trait impulsivity). Thus, the interplay between dispositional self-control and impulsive processes seems to be useful in understanding how individuals may (or may not) inhibit undesired behaviors.

1.2. The present study

Cheval et al. (2015) showed that reflective intentions to engage in PA and impulsive approach tendencies towards sedentary behaviors interacted to predict objectively measured PA: intentions predicted PA for those with low, but not high impulsive approach tendencies towards sedentary behaviors. Here, we provide a secondary analysis of this data

set and investigate how restraint and impulsivity, as facets of self-control, modify the interplay of impulsive and reflective precursors on behavior. Maloney, Grawitch, and Barber (2012) advised researchers to regard restraint and impulsivity as related, but distinct facets of self-control, rather than a unitary construct. This allows for a more finely-grained analysis of their independent effects on behavior. Therefore, here we tested the assumption that the interaction between impulsive and reflective processes should depend on trait restraint and/or trait impulsivity. We hypothesized a *moderated moderation pattern* between PA intentions, IASB, and the restraint and impulsivity facets of dispositional self-control. Specifically, we expected the interactive effect between reflective PA intentions and IASB to be stronger in individuals with low self-control (i.e., high impulsivity and/or low restraint), because impulsive processes should exert a stronger influence in those with low as compared to high self-control. By contrast, the interactive effect between reflective PA intentions and IASB should be weaker in individuals who tend to control their impulsive tendencies more effectively (i.e., low impulsivity and/or high restraint).

2. Method

2.1. Participants, procedure and measures

One hundred and one rather inactive company-employees (52 women and 49 men; $M_{age} = 38.44$, $SD = 8.66$) were recruited through contacts at tertiary sector companies. At the end of a lab-session, they completed a questionnaire including the 8-items of the multi-factor Brief Self-Control Scale (BSCS; Tangney et al., 2004) validated by Maloney et al. (2012), to assess participants' *trait restraint* (e.g., I am good at resisting temptation, 4 items) and *impulsivity* (e.g., Sometimes I can't stop myself from doing something, even if I know it is wrong, 4 items). They next completed a task to assess their impulsive approach tendencies towards PA (IAPA) and sedentary behaviors (IASB; e.g., Mogg et al., 2003). Finally, participants' *intentions to be physically active* (e.g., I intend to carry out at least 30 min MVPA per day on 5 or more days of the week) were assessed. In order to measure objective MVPA, each participant was given an accelerometer and instructed on how and when to wear it during the following eight days. Time spent on MVPA over one week was used as the dependent variable. The design, methods, and primary results of the randomized control trial have been described in detail elsewhere (Cheval et al., 2015).

2.2. Data analyses

Two participants had to be excluded due to accelerometer malfunctions and two further participants did not provide complete data. Data analyses were therefore carried out on 97 participants. Following Maloney et al. (2012), we examined the effects of the two dimensions of the BSCS (i.e. restraint and impulsivity) independently. We conducted two separate moderated moderation analyses (three-way interaction) to test whether the conditional effect of PA intentions × IASB on MVPA obtained in Cheval et al. (2015) varied depending on trait *restraint* (Model 1) and trait *impulsivity* (Model 2). Following the data analysis strategy in Cheval et al. (2015) we controlled for IAPA, and the known PA correlates: sex, age, and BMI. Finally, we examined the first two Models together to investigate the specific contribution of trait restraint and trait impulsivity for behavior regulation (Model 3). Predictor variables were centered in the case of continuous variables and dummy coded in the case of dichotomous variables.

3. Results

3.1. Descriptive statistics

Means, standard deviations, Cronbach alphas, and bivariate correlations are presented in Table 1. Inspection of Table 1 confirms that trait