



Short Communication

Middle choice preference and snack choice: The role of self-regulatory resources to nudge healthier food choice



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ABSTRACT

When confronted with a three-choice paradigm, products placed in the middle position are selected more frequently compared to peripheral options. Under low self-regulatory resource conditions, exploiting the middle position preference may be a promising nudge towards healthier food choices. This study aims to investigate boundary conditions of the middle choice preference in a convenience sample ($n = 182$) using a 2 (high depletion vs. low depletion of self-regulatory resources) \times 2 (low caloric snack position: left vs. middle) between-subjects design. Three different snack bars were positioned from left to right in ascending order of calorie content (apple, chocolate-banana and chocolate) with the apple variety as either positioned on the left side or in the middle position (nudge). Our results showed that across all participants, no middle position preference could be observed between different snacks ($\chi^2_{(2)} = 0.28$, $p = 0.35$), neither for participants in low depletion (36.8%; 35/95), $\chi^2_{(1)} = 0.18$, $p = 0.53$ or high depletion condition (35.6%; 31/87), $\chi^2_{(1)} = 0.83$, $p = 0.25$. Liking and gender did not influence choice behavior. Our findings suggest that nudging healthy middle choice preferences is limited to the extent of self-regulatory resource availability. This boundary condition should be considered when designing public health interventions to nudge healthier food choices based on middle position preferences.

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1. Introduction

Shop design architecture and product presentation drive individuals food choices. Rearranging snacks on shelves or checkout counters is an attractive way to improve snack choices towards healthier options (Marteau, Hollands, & Fletcher, 2012). Research showed that food choices are predominantly guided by simple heuristics (Scheibehenne, Miesler, & Todd, 2007), but choice behavior also depends on aspects of self-regulation processes (Kotabe & Hofmann, 2015). Interventions to promote healthy eating are often based on the assumption that individuals show a sufficient level of self-regulatory resources during decision-making (Herman & Polivy, 2011); however, most food choices are made when people are unable or not willing to exert self-control (Wansink & Sobal, 2007). Snacking pattern most commonly include calorie-dense food associated with long-term health risks. Therefore, exchanging or swapping unfavorable snacks with healthier, low-caloric snack options is an important target for intervention to improve long-term health (O'Connor, Brage, Griffin, Wareham, & Forouhi, 2015).

Health-related decisions can be tweaked (or nudged) by rearranging the immediate food environment. Facilitating these techniques are ascribed to have important implications for nutrition to make healthy choices easy choices (Thaler & Sunstein, 2008). Previous research suggests, that some nudges (e.g., facilitating social proof heuristics) are very effective in favoring healthy food products under low self-control conditions (Salmon et al., 2015). Food positioning is one promising low-threshold intervention as summarized in a systematic review by Bucher et al. (2016), however more high-quality studies are necessary to identify relevant boundary conditions. Developing and evaluating nudging interventions that perform well under low self-control conditions may be key for future public health interventions. Therefore, the present study investigates how one particular nudge (middle choice preference) operates under manipulated self-regulatory resources.

In horizontally presented arrays of products, people chose the middle position more frequently across different product groups (Shaw, Bergen, Brown, & Gallagher, 2000). The preference for middle position options are either caused by inference-based mechanisms, such as believing that the central position is occupied “by good (or important) people” (Valenzuela & Raghuram, 2009), or originates from attention-based mechanisms (Chandon, Hutchinson, Bradlow, & Young, 2009). To date, the underlying

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mechanisms of the middle choice preference including the role of self-regulatory resources are unknown.

In the eating behavior domain, *de Vet and de Ridder (2014)* provided preliminary evidence for the effectiveness of the middle choice option on different portion-sizes of soft drinks. They demonstrated that smaller-sized softdrinks were more frequently chosen when placed in the middle position. *Keller, Markert, and Bucher (2015)* employed the middle choice option to increase choice frequency of a low-caloric (LC) cereal bar in a three-choice paradigm (339 kJ/bar vs. 607 kJ/bar vs. 621 kJ/bar). The likelihood to choose a LC alternative, when positioned in the middle, was threefold higher compared to the side position. Although this preliminary finding is very promising (*Keller et al., 2015*), it may not completely reflect natural choice environments and boundary conditions of this effect could be relevant (e.g., self-regulatory resources). *Bruyneel, Dewitte, Vohs, and Warlop (2006)* showed that individuals more often choose unhealthy snacks when their self-regulatory resources were depleted after conducting a mock shopping trip. The depletion of self-regulatory resources expressed for individuals who recently exerted self-control show consistent self-regulatory failures in a subsequent task (*Hagger, Wood, Stiff, & Chatzisarantis, 2010*). If nudging interventions are expected to be an effective measure, these measures need to sustain under conditions that reflect decision-making situations in manipulated self-regulatory control conditions. We hypothesize, that the depletion of self-regulatory resources lead to more automatic behavior guided by simple heuristics (e.g., either increased middle-position preference, right-hand or unhealthy snack choice).

The aim of the present study is twofold, to (i) investigate how middle choice preference performs when self-regulatory resources are manipulated (high vs. low depletion) and (ii) how this affects the middle choice preference for a low-caloric snack (apple snack bar) in a three choice paradigm. The presented study aims to replicate previous findings from *Keller et al. (2015)* to test for robustness of this paradigm.

2. Material and methods

2.1. Participants and study design

Our total study sample of 182 participants included 47 male and 135 female students from the University of Vienna (age: $M = 23.6$, $SD = 3.8$). Most participants were right-handed (88%). Participants were individually recruited on campus (Faculty of Life Sciences, University of Vienna) and online.

To investigate whether self-regulatory resources affect the middle choice preference in a three choice paradigm, we applied a 2 (high depletion vs. low depletion of self-regulatory resources) \times 2 (LC position: left vs. middle) between-subjects design using urn randomization (*Wei & Lachin, 1988*) and a priori sample size calculation using G*Power 3.1 (*Erdfelder, Faul, Buchner, & Lang, 2009*) based on the effect size of $w = 0.35$ (*Keller et al., 2015*) with $\alpha = 0.01$ and $\beta = 0.95$.

2.2. Materials and procedure

We used three well-known cereal bars with different taste varieties from one brand (brand: Knusperone, Hofer store brand): one LC (apple) and two similar high-caloric (banana-chocolate; chocolate) cereal bars. All cereal bars are nationwide available at a large discounter supermarket (Hofer). The bar with the lowest calories was the apple variety with 81.2 kcal/bar (energy density: 3.2 kcal/g). The other two bars had higher caloric content; banana-chocolate flavor with 110 kcal/bar (energy density: 4.2 kcal/g) and chocolate flavor with 115 kcal/bar (caloric density:

4.6 kcal/g). The snack bars were slightly dissimilar in weight (apple bar = 30 vs. other two bars = 25 g) and size (apple bar width = 3.5 cm; other two bars = 4 cm). The visual appearance of the three varieties was different. The apple bar was green, the banana-chocolate bar was yellow, and the chocolate bar was dark-brown. No information about the energy content was printed on the snack wrappers.

In all four study conditions the three cereal bars were positioned on a serving tray. The cereal bars were clearly arranged on the left, middle and right side of the serving tray. The tray was refilled between testing; every participant was confronted with the same amount of cereal bars (10 per row). The cereal bars were positioned from left to right in ascending order of calorie content analogous to the arrangement used in the study of *Keller et al. (2015)*. The control condition (LC position: left) was arranged as follows: apple/lowest calorie content = left position; banana-chocolate/high calorie content = middle position; chocolate/highest calorie content = right position. In the experimental condition (LC position: middle) the low-caloric cereal bar (apple) and banana-chocolate cereal bar switched positions (see *Fig. 1*).

2.2.1. Depletion task

We used a mathematic counting task to deplete self-regulatory resources. This task has previously shown to be an effective intervention to deplete self-regulatory resources (*Missbach, Florack, Weissmann, & König, 2014*). Participants in the high self-regulatory depletion condition had to count backwards from 500 in multiple steps of seven while standing on one leg. Participants in the low self-regulatory depletion condition were instructed to count backwards from 500 in multiples of five while standing on both legs, a task that was expected to require no self-control (time was measured to assess the length of the depletion task). To test for successful induction of self-regulatory depletion, difficulty, effort and fatiguing was assessed after the task.

2.2.2. Procedure

We used an unrelated task as a cover-story to recruit participants (recognizing theme songs from 10 different TV shows; length of a single sound snippet: 5 s). After arrival, participants were informed that their data would be treated confidentially and written informed consent was obtained from all participants. The study was conducted in line with the principles of the Declaration of Helsinki and participants were informed that they could withdraw their participation at any time during the experiment.

The study participants were examined in single-testing situations and after completion, they would get a snack bar as a reward for participation. After random assignment to one of the four study conditions the participants were asked to fill out a short questionnaire (demographic data) and were then accompanied into a separate room to perform the 5-min sound snippet test. Recognition accuracy results were not of interest for our study. Subsequently, all participants performed one depletion task (high depletion or low depletion) and were then asked to sit down and take a short

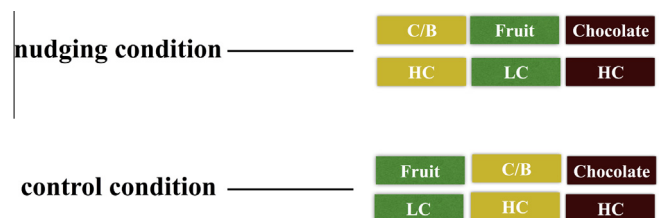


Fig. 1. Snack positioning on snack tray presented to study participants. Notes. C/B = chocolate-banana cereal.

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