Eating behaviour, health locus of control and stages of change towards healthy eating among Portuguese undergraduate students

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Introduction and aims

Eating behaviour refers to quantitative and qualitative features of the selection and decision on the foods to be consumed [1]. Knowledge on determinants of eating behaviour increases the success of actions and interventions aiming to promote healthy eating habits and to prevent diseases [2].

Several constructs facilitate the comprehension of health-related changes, among which the **Locus of Control (LoC)** [3,4]. Internal LoC (i-LoC) corresponds to the belief that personal results are related to personality, capacity, and will power, while external LoC (e-LoC) means that these results are attributed to "other powerful" (*e.g.* doctors) or randomly assigned by chance [5]. Overall, i-LoC is associated with better health outcomes [6]. The Transtheoretical Model [7] is based on the notion of **Stages of Change (SoC)**: a series of five stages that individuals must progress towards a specific behavioural transformation [8].

The literature is scarce regarding the relationships of eating behaviour dimensions with LoC and SoC. Therefore, our **aim** was to study the **relationships between several dimensions of eating behaviour with the health LoC and SoC towards healthy eating** among Portuguese higher education students.

Methods

A convenience sample of **267 higher education students** (63.7% females; 18 to 27 years) was assessed regarding: **health LoC** (Health Locus of Control Scale [9]), **SoC towards healthy eating** (adapted from [10] to refer specifically to the adoption of healthy eating), **emotional and external eating** (Dutch Eating Behavior Questionnaire [11]), **flexible and rigid control** of eating behaviour ([12]: Portuguese version of the subscales proposed by Westenhoefer), **binge eating** severity (Portuguese version of the Binge Eating Scale [13]), and **eating self-efficacy** (General Eating Self-Efficacy Scale [14]).

Given the difference between males and females eating behavior [15], all **data were analysed separately per sex**. Spearman's correlation coefficients (r_s) were calculated to measure the association of eating behaviour dimensions with LoC. Oneway ANOVA was used to compare eating behaviour between SoC. When significant differences were found, pairs of stages were compared with post-hoc analysis using Student's t-test with Bonferroni's correction. The null hypothesis was rejected when $p < 0.05$.

Results

Table 1 presents the correlations of eating behaviour dimensions with health LoC. Among **females**, **i-LoC assessed through the factor "locus of control"** was **negatively associated with binge eating** and **positively with eating self-efficacy**. However, we also found a **negative association between eating self-efficacy and i-LoC assessed by the factor "other powerful"**. Among **men**, **no significant associations** were found between health LoC and any of the eating behaviour dimensions.

FEMALES (n = 170)	Health LoC: Total score *	Health LoC: Factor "locus of control" *	Health LoC: Factor "other powerful" *
Emotional eating	-0.064 (0.405)	-0.111 (0.151)	0.030 (0.696)
External eating	-0.029 (0.705)	-0.095 (0.217)	0.067 (0.384)
Flexible control	0.009 (0.906)	0.088 (0.252)	-0.091 (0.240)
Rigid control	-0.005 (0.953)	0.062 (0.424)	-0.081 (0.297)
Binge eating	-0.144 (0.062)	-0.217 (0.004)	0.032 (0.680)
Eating self-efficacy	0.061 (0.433)	0.212 (0.005)	-0.157 (0.041)
MALES (n = 97)	**Health LoC: Total score ***	**Health LoC: Factor "locus of control" ***	**Health LoC: Factor "other powerful" ***
Emotional eating	-0.166 (0.105)	-0.180 (0.077)	-0.044 (0.670)
External eating	-0.098 (0.338)	-0.088 (0.394)	-0.045 (0.661)
Flexible control	-0.053 (0.603)	-0.017 (0.869)	-0.055 (0.595)
Rigid control	-0.001 (0.992)	0.102 (0.319)	-0.102 (0.321)
Binge eating	-0.073 (0.474)	-0.043 (0.673)	-0.055 (0.590)
Eating self-efficacy	-0.024 (0.813)	0.083 (0.421)	-0.114 (0.267)

Data presented as r_s (p). * Higher scores correspond to the internal LoC.

Table 1. Associations of BMI and eating behaviour with health LoC

More than half of the males and almost half of the females were classified in the stage of maintenance. Table 2 compares eating behaviour dimensions between stages of change towards healthy eating.

Among **females**, the **highest levels of emotional, external and binge eating** were found for those in **pre-contemplation or contemplation** stages. Women in the decision stage didn't differ from those (pre-contemplation or contemplation) regarding binge eating. **Flexible control was highest in the maintenance stage**. **The same was found for eating self-efficacy**, but regarding this dimension, females in the action or relapse stages didn't significantly differ from those who referred to maintain healthy eating.

Among **males**, **external eating was highest in the earlier stages of change** (pre-contemplation or contemplation). **Binge eating was higher in pre-contemplation to action** stages. Although there were overall differences for both types of restraint in men, regarding flexible control no significant differences were found between pairs of stages in the post-hoc tests, but **men in the action stage had higher levels of rigid control**. **Eating self-efficacy was highest among men at the maintenance stage**.

FEMALES (n = 170)	Pre-contemplation or contemplation	Decision	Action	Maintenance	Relapse	*p* *
Emotional eating	2.88 (0.74) b	2.21 (0.79) ab	2.35 (0.84) ab	1.96 (0.80) a	1.85 (0.76) a	0.001
External eating	3.47 (0.74) b	2.79 (0.51) a	2.90 (0.63) ab	2.62 (0.64) a	2.73 (0.51) a	< 0.001
Flexible control	3.54 (2.73) a	4.62 (2.59) ab	6.00 (1.29) ab	6.15 (2.68) b	5.04 (3.31) ab	0.003
Rigid control	4.69 (3.15)	4.35 (2.82)	5.54 (2.33)	5.38 (2.85)	5.46 (4.30)	0.491
Binge eating	8.34 (0.97) b	5.91 (1.19) b	4.83 (1.31) ab	2.78 (1.37) a	4.50 (1.20) ab	< 0.001
Eating self-efficacy	7.69 (4.33) c	10.35 (3.34) bc	11.85 (2.58) ab	14.06 (3.14) a	12.39 (3.90) ab	< 0.001
MALES (n = 97)	**Pre-contemplation or contemplation**	**Decision**	**Action**	**Maintenance**	**Relapse**	***p*** *
Emotional eating	1.85 (0.82)	1.70 (0.79)	1.88 (0.71)	1.42 (0.54)	1.46 (0.47)	0.077
External eating	3.13 (0.64) b	3.05 (0.44) ab	2.90 (0.66) ab	2.54 (0.60) a	2.68 (0.19) ab	0.002
Flexible control	3.27 (2.40) a	3.23 (2.35) a	5.63 (2.92) a	4.55 (2.63) a	2.40 (1.67) a	0.050**
Rigid control	2.47 (2.77) a	3.23 (2.01) ab	6.50 (3.21) b	4.14 (2.81) ab	2.80 (1.64) ab	0.012
Binge eating	5.12 (0.78) b	5.87 (1.28) b	6.38 (0.92) b	2.15 (1.07) a	2.47 (1.16) ab	< 0.001
Eating self-efficacy	11.53 (3.78) a	10.62 (3.38) a	11.38 (2.26) a	15.52 (2.86) b	12.00 (5.05) ab	< 0.001

Data presented as Mean (SD). * Comparisons between stages (Oneway ANOVA). The presence of the same letter indicates no significant difference between the pair of stages (independent samples t-test with Bonferroni's correction). ** $p < 0.05$.

Table 2. Eating behaviour comparison between stages of change

Final remarks

Our results suggest that SoC and LoC may be useful to achieve deeper knowledge on eating behaviour. Their assessement may also help designing early and sex-directed (namely regarding different types of dietary restraint) programs and interventions focusing eating behaviour.

References: [1] Viana, 2002. [2] Ni *et al.*, 1997. [3] Rotter, 1954. [4] Walston, 1992. [5] Ribeiro, 1994. [6] Horne & Weinman, 1996. [7] Prochaska *et al.*, 1992. [8] Velicer *et al.*, 1998. [9] Ribeiro, 1994. [10] Kearney *et al.*, 1999. [11] Van Strien *et al.*, 1986. [12] Poínhos, Rowcliffe *et al.*, 2013. [13] Freitas *et al.*, 2001. [14] Poínhos, Canelas *et al.*, 2013. [15] Konttinen *et al.*, 2009.