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## **Emotional and instrumental aggressiveness and body weight loss**

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### **ABSTRACT**

Violence and aggressiveness are social concerns. Also, at a time of rising prevalence of obesity, many people tend to control their body weight through dieting. We analyzed the impact of weight loss on aggressiveness: 150 participants completed anonymously two questionnaires assessing their aggressiveness, age, sex, diet, recent body weight change, reasons of recent body weight changes, and perceived difficulties related to those changes. Results showed that participants who had deliberately lost weight reported higher aggressiveness than controls, but passive weight-losers did not. The raised aggressiveness was stronger for hostile aggression than for instrumental aggression. Such a rise is likely to be due to the discomfort associated with opposing body weight set-point.

**Keywords:** aggression, dieting, weight loss, body weight regulation, set-point.

### **INTRODUCTION**

In a context of rising prevalence of obesity, many people tend to control their body weight by dieting. At a time when high prevalence of violence and aggression remains a permanent social concern (Chesnay, 2003), we explored the influence of dieting on aggressiveness.

The impact of several specific diets on mood and cognitive performances are currently giving rise to an increasing number of studies. A low-fat

diet was shown to increase anger-hostility and tension-anxiety parameters compared to isocaloric control diet (Wells, Read, Laugharne, & Ahluwalia, 1998). On the other hand, a low-carbohydrate (hi-fat) diet, also isocaloric, had a similar effect, in addition to a decrease in physical performance (Butki, Baumstark, & Driver, 2003; Filaire, Maso, Degoutte, Jouanel, & Lac, 2001). Other diet changes influenced other traits: a hi-carbohydrate/low-protein diet could help to cope with stress-proneness (Markus, Panhuysen, Tuiten, & Koppeschaar, 2000). Deijen et al. (1989), on the basis of an experiment with dieters on a protein-rich diet, concluded that dietary composition had no effect on mood and behavior.

These above mentioned studies focused on the effect of specific diet composition, but the impact of changes in energy intake and weight loss on mood remains unclear. Bryan and Tiggemann (2001) reported that weight loss can improve some aspects of psychological well-being such a better feeling of self-control and can decrease depression and anger. On the other hand, Hall and Lane (2001) observed that judo athletes losing weight quickly in preparation for a competition, not only experienced a decrease in physical performance and vigor, but also showed increased anger, fatigue, and tension.

Aggression is a heterogeneous phenomenon that can take place in several situations and covers a wide spectrum of different behaviors and meanings. Many classifications of human aggression have been proposed, reflecting a wide array of paradigms and research goals. Most of these classifications follow a common dichotomy, even when using different terminologies: on the one hand, the "instrumental-controlled-proactive-cold blooded-offensive-predatory-premeditated" type, and on the other hand, the "emotional-hostile-impulsive-reactive-hot blooded-defensive-affective" type (Ramirez & Andreu, 2003). Aggression thus belongs to two categories: a) instrumental aggression, chiefly aimed at obtaining a reward, such as some goal or advantage for the aggressor, without anger to trigger it; and b) hostile, impulsive, or emotional aggression, which is carried out in an outburst of rage or anger, aiming merely at harming another person, without necessarily weighing costs and benefits (Berkowitz, 1993; Feshback, 1964; Hartup, 1974; Kingsbury, Lambert, & Hendrickse, 1997). Certain traits or factors predispose individuals to higher or lower levels of aggression. This predisposition may be called aggressiveness.

Our hypothesis was that aggressiveness related to emotional aggression, related to the individual's mood, would be more influenced by dieting than aggressiveness related to the more rational instrumental

aggression. This hypothesis would be justified by the fact that people who have recently lost weight through dieting are presumably below their body weight set-point. According to the body weight regulation paradigm, body weight is regulated at a "set-point" (Cabanac, 2001; Cabanac, Duclaux, & Spector, 1971; Hervey, 1969). A deliberate weight loss presumably generates a difference between actual body weight and set-point. We explored the hypothesis that such a difference (called "error-signal"), is interpreted by the body as a situation of "lack" or "need," a situation susceptible to arouse discomfort and, in turn, to alter aggressiveness.

## **METHODS**

One hundred and fifty participants of all ages (60 males and 90 females; 16-82 years old) were anonymously recruited at random among men and women met in public spaces such as university campus and shopping centers. No participant was obese, as visually estimated. Full anonymity and confidentiality were observed. All participants were invited to answer anonymously two questionnaires.

Questionnaire 1 (Q1) was a French translation of the CAMA test that probes aggressiveness. The acronym of CAMA, meaning Cuestionario de Actitudes Morales sobre Agresión, is a questionnaire originally constructed by Lagerspetz and Westman (1980), and subsequently revised by Ramirez (1991) and Andreu (2001) in order to investigate attitudes towards interpersonal aggression in different situations from the observer's perspective. Since the degree of approval would depend on the qualities of the behavior observed, the items describe several aggressive acts of different quality and intensity, from 'gentlest' to most harmful, in combination with different instrumental and hostile situations in which they may be conducted.

The eight categories of aggressive acts and the eight different circumstances in which the aggressive behavior may be justified are presented in Table 1. The response scale for the questionnaire is a two-point scale (acceptable vs. not acceptable)

This questionnaire has already been administered to about 3000 respondents, ranging in age from 12 to 90, and in quite varied cultures: in Finland (Lagerspetz & Westman, 1980), Britain (Benton, Kumari, & Brain, 1982), Poland (Fraczek, 1985) ; Spain (Ramirez, 1991, 1993), Japan and the U.S.A. (Fujihara, Kohyama, Andreu, & Ramirez, 1999; Ramirez & Fujihara, 1997), Iran (Fujihara, Andreu, Musazadeh, &

Ramirez, 2000), and Canada (Ramirez, Bonniot-Cabanac, & Cabanac, 2005). Internal consistency reliability in those studies, calculated with Cronbach's alpha, has ranged from .77 to .91, indicating that it is internally consistent. The internal consistency for the subtests in the Finnish population was .91 (Lagerspetz & Westman, 1980). A factorial analysis of the principal components of CAMA and varimax rotation demonstrated two groups of situations ( $>0.35$ ) internally consistent and relatively independent of one another (Ramirez & Andreu, unpublished results).

Questionnaire 2 (Q2) followed with questions about the participant's present diet, age, sex, and body weight. In addition, this questionnaire explored the time course of body weight over the previous month. Q2 was deliberately presented after Q1 in order to avoid providing any hint about the purpose of the study to the participant.

Table I: The 8 actions and 8 situations presented in the Questionnaire 1 (CAMA test)

Results were analyzed as global frequency of yeses and nos in the group of participants. Then the results were analyzed by intensity of response: the group frequency of acceptance of a specific act (the number of times in which this act had been considered justified) was plotted against each of these possible behaviors. The same analysis was conducted regarding situations: the group number of acceptance of aggressive acts was plotted against each of the eight situations. In that way, each act or situation received a score between 0 and 8. Multivariate analysis of variance (MANOVA) was conducted for act score and for situation score with the following factors: act or situation with 8 levels, gender with 2 levels, and weight loss with three levels (passive weightloss; active weight-loss, control). Independent post hoc Student's t-tests were performed when necessary (Sig:  $P < 0.05$ ).

## RESULTS

Out of the 150 participants, 46 (30.6%) declared to have lost weight recently. Weight loss ranged from 2.0 kg to 15.0 kg with a mean ( $\pm$ se) weight loss of  $4.9 \pm 0.44$  kg. There was no significant difference between mean weight loss of men and women ( $P = 0.47$ ). ANOVA revealed no significant difference between responses given by men and by women to Questionnaire 1, i.e. their global degree of aggressiveness was similar. Therefore, the results were pooled for subsequent analysis.

Out of the 46 participants who had declared recent weight loss, 19 were passive weight losers, 26 were active weight-losers, i.e. was dieting, and 1 had not answered the related question. The remaining 104 participants were considered as controls.

Figure 1 presents the global aggression acceptance score. It can be seen that the aggression score of active weight-losers, was above that of controls. In addition, the score of passive weight-losers did not differ from controls ( $P > 0.1$ ).

Fig.1: Global degree of acceptance of aggressive acts by passive weight-losers ( $n=19$ ), active weight-losers ( $n=26$ ) and controls ( $n=104$ ). Bars with different superscripts are significantly different from each other (Student t-test,  $P < 0.05$ )

Figure 2 presents the group frequency of acceptance for the various aggressive acts, plotted in rising intensity. There was a general decrease of the acceptance of aggressive behaviors with rising intensity. Stopping (hindering), a passive aggressive act, was accepted by the largest number of respondents. All acts, except hindering, were more accepted by active weight-losers than by passive weight-losers and controls, but only mild acts, shouting and hitting reached significant difference ( $P < 0.05$ ).

Fig.2: Magnitude of aggressiveness related to 8 aggressive acts in groups of participants sorted according to recent body weight change: passive weight-losers ( $n=19$ ), active weight-losers ( $n=26$ ) and controls ( $n=104$ ). Bars with different superscripts are significantly different from each other (Student t-test,  $P < 0.05$ ).

Figure 3 presents the group frequency of acceptance for the various aggressive acts, sorted according to the situations. Both situations related to hostile aggression were significantly affected by active weight loss: "Severed communication" and "Anger." In instrumental situations, active weight-losers group reached a significant rise only in situation of "Preservation of reputation."

Fig.3: Magnitude of aggressiveness in 8 specific situations in groups of

participants sorted according to recent body weight change: passive weight-losers ( $n=19$ ), active weight-losers ( $n=26$ ) and controls ( $n=104$ ). Bars with different superscripts are significantly different from each other (Student  $t$ -test,  $P < 0.05$ ).

## DISCUSSION

"Folk psychology" tends to consider that men are generally more aggressive and they would justify aggression more than women. This point of view was confirmed by many studies, that have revealed differences between men and women about their representation of aggression (Andreu et al., 2002; Archer & Haigh, 1999; Hines & Saudino, 2003; Ramirez, Andreu, & Fujihara, 2001), its justification or acceptability (Archer & McDaniel, 1995; Astin, Redston, & Campbell, 2003; Stewart-Williams, 2002), and its occurrence (Connor, Steingard, Anderson, & Melloni, 2003; Graham & Wells, 2001; Kinney, Smith, & Donzella, 2001; Knight, Guthrie, Page, & Fabes, 2002; Zeichner, Parrott, & Frey, 2003). However, our results limited to attitude toward aggressiveness, did not show such sexual differences; thus, they rather confirmed other studies in which differences between men and women were also absent or minute (Ramirez, Fujihara, & van Goozen, 2001). This absence of sexual difference may be explained by the fact that, in this present work, the change of the degree of aggressiveness was related to the defense of body weight, which implies fundamental survival behaviors, equally present in males and females.

It is not surprising to discover that mildly aggressive acts were significantly more acceptable than stronger and more drastic acts least (Fig. 2). Also, it is interesting that altruistic behavior was the most accepted cause (situation) of aggression, followed closely by self-defence (Fig. 3). These observations in this group of Canadian participants matched with what has been previously found in other quite different cultures of four continents (Ramírez, 2003).

The higher aggressiveness in the active-weight-loss group was especially significant for the mild aggressive acts (Being ironic, Threatening). Even if this trend in aggressiveness was also observed for stronger aggressive acts (Having a fit of rage, Stopping another person from doing something, Shouting, Hitting, Torturing, Killing), such a rise was less significant for any of the intensely aggressive items. This lower influence of body weight loss on the aggressive acts of stronger intensity may be explained by its relation to strong moral beliefs, unlikely to be influenced by the mood (Ramirez, 1993). Thus, aggressiveness related to clearly and extremely aggressive acts is likely to be less sensitive to

the effect of mood-related physiological changes, such as weight loss, and more sensitive to rational influence.

The influence of active weight loss was significant only for aggressiveness related to hostile aggression (Severed communication, Anger). No situation of instrumental aggression (Self-defense, Protection of somebody else, Defense of one's property, Punishment, To obtain sexual resources) reached a significant difference, except Preservation of reputation, but this latter situation, even if labelled 'instrumental' a priori, also implies an important emotional load. Such a difference between hostile and instrumental aggressiveness is consistent with an inhibitory influence of rationality on aggressiveness. Instrumental aggression is a premeditated behavior aiming at a specific advantage for the aggressor. It is a rather rational technique used as a strategy to achieve some social or material goals (Berkowitz, 1993). We may assume that motivational goals of instrumental aggression are harder to be modified by weight loss. It seems normal, thus, to observe no difference in aggressiveness related to instrumental situations between controls and active weight-losers. On the contrary, hostile aggression is an impulsive, thoughtless behavior, i.e. less rational and more emotional (Ramirez & Andreu, 2003). Thus, being more mood-related, hostile aggressiveness is likely to be more sensitive to the effect on mood of physiological changes, such as body weight loss.

Those participants who had lost weight actively showed a significantly higher degree of aggressiveness than participants who had lost weight passively, i.e. involuntarily, without effort, and without discomfort. There was no difference between passive weight-losers and controls. Thus, weight loss influenced aggressiveness only when this weight loss had been achieved actively, with personal efforts. Those observations are in accordance with the hypothesis that weight loss raised the level of aggressiveness because of a discomfort resulting from an error-signal in body weight regulation i.e. a difference between actual body weight and the set-point (Cabanac, 1971; Cabanac et al., 1971; Hervey, 1969). The 'set-point' is the virtual body weight that the regulatory system aims at maintaining steady. An 'error-signal' is a difference between actual body weight and set-point body weight. To loose weight is difficult when behavior opposes the physiological defence mechanisms that maintain a stable body weight (Cabanac, 2001). Thus, to keep body weight under its set-point requires chronic efforts. A similar situation has been found in the studies on the psychological effect of hypoglycemia, which represents a more acute discomfort (Andrade, Benton, Brain, Ramirez, & Walmsley, 1988; Benton et al., 1982; Gold, MacLeod, Frier, & Deary, 1995; Roy, Virkkunen, & Linnoila, 1988;

Woods, 1991). On the other hand, passive weight-losers did not have to make efforts to loose weight, thus their actual body weight was presumably congruent with their set-point, i.e. there was no error-signal in their body weight regulation. Such a hypothesis would agree with their lower aggressiveness scores, similar to those of controls, because they did not feel the discomfort of the error-signal.

We saw above that several specific diets low-fat (Wells et al., 1998) as well as high-fat (Butki et al., 2003; Filaire et al., 2001) correlated with changes in mood and cognitive and physical performance. Other diet changes influenced other traits (Markus et al., 2000). These heterogenous and contradictory results might be reconciled in the light of our present results. The diet composition might be less important than weight loss, which is the common denominator of those studies.

In summary, the above results show that active weight loss may be associated with an increased aggressiveness, at least of those milder acts and in hostile, non-instrumental, situations. We believe that living under an 'error-signal situation' regarding body weight is uncomfortable and may increase aggressiveness, but the opposite relationship might be present: those participants who were more aggressive might have been more successful in loosing weight. Diets and weight loss programs that lower the set-point should be able to answer that ambiguity: they are more likely to be successful and less unpleasant than those that keep an error-signal.

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Michel Cabanc (MD), is a recognized Physiologist, since he chaired IUPS Commission on Thermal Biology, was invited to write an Annual Review of Physiology, to contribute to the Handbook of Physiology and to Encyclopaedia of Neurosciences, and publishes regularly in Physiology journals. He is also recognized by Psychologists: his deep influence on Physiological Psychology and Motivation, results from his papers on pleasure, and can be recognized in his numerous invitations to address meetings of experimental psychology.

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