Scientific Aspects of Weight Management

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Extended Abstracts

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Meal Replacements in the Therapy of Obesity

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Liquid meal replacements are a popular form of so-called “portion-controlled diet”. Shakes and meal bars provide patients a fixed quantity of food with a high proportion of protein, a fixed calorie content (i.e., 140 to 220 kcal/d) and are usually fully supplemented with micronutrients. In contrast to very low calorie diets, where liquid meal replacements are exclusively used, meal replacement strategies combine one or two daily meal replacements (MR) with conventional foods at the other meals. The German Obesity Association (2007) distinguishes between Step 3 of dietetic treatment of obesity (MR in combination with conventional foods) and Step 4 (full liquid low or very low calorie diet without conventional foods). Wadden et al. (2007) concluded in a comprehensive review, that patients’ consumption of portion-controlled diets, including liquid MR (Step 3 of dietetic treatment), was associated with significantly greater short-term weight loss than was the consumption of isocaloric diets comprised of conventional foods (Wadden et al., 2007).

A meta-analysis by Heymsfield et al. (2003) of six randomized controlled trials found that after 12 months of treatment, participants who used MR maintained a loss 2.4 to 3.4 kg greater than persons who consumed a diet of conventional foods with the same calorie target. Ditschuneit et al. (1999) found that patients who replaced two meals and two snacks a day with liquid shakes (and snack bar) lost 7.8% of their initial weight during 3 months of treatment, compared with a loss of only 1.5% for patients who were prescribed the same number of calories (1200–1500 kcal/d) but consumed a self-selected diet of conventional foods. After this initial period participants in both groups replaced one meal and one snack a day with a liquid shake or meal bar. Patients in the original (3-month) MR group maintained a loss of 11.3% of initial weight 2 years after treatment and 8.4% at a 4-year follow-up (Flechtner-Mors et al., 2000). Patients who were originally treated by the conventional diet but were switched to MR maintained a loss of 3.2% of initial weight at 4 years. In the Lookahead trial (Wadden et al., 2009) it could be shown in a big sample of obese patients with type 2 diabetes, that there is a clear association between the number of meal replacements used per year and weight loss at 12 months. Patients in the highest quartile of MR usage (608 p. a.) lost 11.2% of initial body weight compared to the lowest quartile of MR usage (117 p. a.) with 5.9%.

MRs are a helpful dietetic strategy for obese subjects to limit energy intake, mainly because obese individuals generally underestimate their food intake by 30% to 50% when eating a diet of conventional foods (Lichtman et al., 1992). This is attributable to misjudging portion sizes, failing to recognize hidden sources of energy, and/or forgetting some of the foods consumed.

To maximize treatment success MR as a dietetic strategy should be combined with behavior modification (counseling), increasing physical activity and – depending on individual risk and previous efforts – pharmacological therapy.

References


Functional Ingredients and Foods: Targeting Satiety for Appetite Control and Weight Management Health Claims

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There is a clear demand for products that help consumers manage their own body weight (induce weight loss and/or prevent weight gain or regain). Such products need to make a direct contribution to effective appetite control. Few approaches, with the exception of meal replacements and very low calorie diets, have been approved by the European Food Safety Authority (EFSA) for either appetite control or weight management. Draft guidance indicates that EFSA are looking for clear sustainable effects on appetite, across multiple meals, across the day, in experimental studies and a durability of effect that is apparent for at least 28 days of product use [1]. Nonetheless, despite the weakness of the current evidence base we have the protocols and measures to substantiate appetite and weight related health claims [2].

Foods that strengthen within-meal satiation and post-meal satiety increase feelings of fullness that control meal-size and reduce feelings of hunger between meals [2, 3]. This has the potential to reduce
energy intake by decreasing the amount consumed both at and between meals. If these effects are sustained across the day and endure over repeated exposure, such foods have potential for weight management. All consumption inhibits eating behaviour to some extent, an effect determined by the composition and energy content of the food or beverage. The strength and timing of these signals is largely dependent on the sensory, physical and chemical properties of the food or drink. It is therefore important to consider i) the appearance and sensory impact of foods and beverages, ii) the mechanics of their digestion, iii) the pre-absorptive effects of their constituents within the gastrointestinal tract, and iv) the post-absorptive effects of the products of digestion. Functional ingredients and changes in food structure can influence the release of peripheral factors, such as ghrelin hormones like Ghrelin, CCK, GLP-1 and PYY, that regulate gut function. The release of these gut peptides in response to various nutrients can have potent effects on appetite, in part through delaying gastric emptying, which strengthens and prolongs the inhibition of eating behaviour. A variety of ingredients produce such effects including proteins, slowly digestible carbohydrates and various fibre types, influencing appetite [3]. Data is often equivocal, as effectiveness of these ingredients is dependent on i) the foods into which they are combined, ii) the timing of measures within protocols, and iii) the appropriateness of the chosen control. Nonetheless, such studies provide important proof-of-concept from which potential products can be developed. This requires that the product used in the study is sufficiently similar to the end product, and the behavioural evidence from the study is sufficient to support the actual intended use. Certain oil-based products have also been shown to influence appetite [3]. These effects are consistent with the effects of free fatty acids, chain length 12 and above, in the small intestine on CCK, GLP-1 and PYY which delay gastric emptying and oro-cecal transit. The effects of oat and palm oil on appetite were established in early trials although subsequent studies have not replicated these effects [4–8]. Nonetheless, like many approaches, the effectiveness of this ingredient has yet to be fully optimised through food formulation. Modifications to food structure may provide opportunities for innovation and this can be tested with biomarkers in vitro and in vivo.

The benefits of satiety-enhancing ingredients to both consumers and their health are under research. It is possible that such ingredients help consumers gain control over their eating behaviour and may also help reduce the negative psychological impact of dieting and the physiological consequences of energy restriction, inducing changes in gut hormone function [9]. The challenge remains to demonstrate their enduring effects on appetite and energy intake, and the health and consumer benefits such effects provide in terms of optimising successful weight management.

References


3 Motivation, Volition and Weight Management

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Weight management is based on a lifestyle which involves regular physical activity and a healthy (well-balanced) diet. Intervention programs for treating overweight and adiposity which focus on dietary change and physical exercise often do not lead to the desired long-term reduction in weight and thus to an improved state of health (Douketis et al., 2005; Perri & Corsica, 2002; Stevens, Truesdale, McClain & Cai, 2006). Most participants in such programs lose approximately 10% of their initial body weight within six months (National Institutes of Health, 1998). However, long-term evaluation of one-year follow-up programs shows weight loss of at least 10% of initial weight only for a fifth of the participants in a program (Wing & Phelan, 2005). Jakicic et al. (2008) report weight loss of at least 10% at 24 months for approximately 30% of participants, but only when they reach high levels of physical exercise (275 min/week). In Germany, it is estimated that only 25% of participants in weight-loss programs succeed in maintaining a weight loss of at least 5% at a three-year follow-up (Westenhöfer, 2005). In an overview of 23 interventions, Sharma (2007) reports that only two were conducted by trained personnel and that the majority of them lacked a standardized behavioral basis. Moreover, most of the interventions were based on theoretical considerations which were almost exclusively concerned with the influence of motivation (Franz et al., 2007). Research shows that people are often highly motivated to adopt a healthy lifestyle; however, they do not succeed of actually accomplishing this. They require help in making and implementing concrete plans (so-called implementation intentions; Gollwitzer, 1999) and shielding them against confounding factors in daily life.

M.O.B.I.L.I.S. is a standardized and theory-driven interdisciplinary training program for adipose adults (Berg et al., 2008; 2010; Göhner & Fuchs, 2006). In addition to an exercise program and dietary advice, the program offers participants medical supervision and comprehensive psychological support by skilled trainers. The psychological support is based on the MoVo concept (Fuchs, Göhner & Seelig, 2011; Göhner, Seelig & Fuchs, 2009) that was designed to serve both to motivate the participants and, most importantly, to help them reach their targets and implement their plans. The MoVo concept integrates central elements of social cognition research with a strong focus on motivational...
aspects (Conner & Norman, 2005; Rutter & Quine, 2002) as well as central elements of action control theories (de Ridder & de Wit, 2006), which emphasize the volitional (self-regulatory) side of behavioral control (Baumeister & Vohs, 2004). According to the MoVo concept, engaging in physical exercise and maintaining a healthy diet requires positive outcome expectations, high self-efficacy, strong goal intentions, concrete action plans, effective barrier management, and positive outcome experiences (Fuchs et al., 2011, Göhner et al., 2009).

This presentation reports on the effectiveness of the intervention program. Participants were taught cognitive-behavioral strategies of goal setting, action planning, barrier management and self-monitoring. N = 316 persons with obesity followed a public advertisement to participate in the intervention program (IG) or comparison group (CG) (quasi-experimental design). Assessments were conducted at four time points, with the last assessment being conducted two years after baseline. At the 24-month follow-up, the IG showed weight loss of 5.57%, whereas the CG lost 1.12% of their weight (t1–t4, p < .01). The results yielded significant interaction terms (group x time), indicating that the intervention had a substantial effect on food choice and level of physical exercise (p<.01). The IG showed significantly enhanced self-efficacy, stronger goal intentions, and a more concrete action planning than the CG at follow-ups.

These findings suggest that intervention programs based on the MoVo concept have the potential to evoke enduring changes in the cognitions we hypothesized to be responsible for inducing obese adults to begin and continue regular exercise and healthy eating behavior, resulting in substantial weight loss. The presentation will discuss implications for further research and practice in the realm of weight management.

References


4 Internet-Based Approaches in Weight Management

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Objective: Overweight and obesity increase a person’s risk of developing non-communicable diseases, shortening life expectancy and adversely affecting the quality of life [1]. Given the steady rise in the prevalence of overweight and obesity [2], effective intervention strategies for weight management are required. Due to the fact that obesity and overweight are social phenomena linked with alterable lifestyle issues [3, 4], the epidemic trend is reversible. The WHO’s recommendations for preventing and managing weight gain emphasize the need for early prevention to ensure lifelong healthy eating and physical activity patterns [5].

Challenging Situation: Despite their high motivation to change their lifestyle, the majority of people fail to follow the recommendations for physical activity and a healthy diet. This phenomenon has been labelled the intention-behaviour gap [6], and should be considered in intervention strategies. Moreover, treatments should be based on a comprehensive weight management program to produce and maintain weight loss over a long period of time. However, most participants of a behavioral intervention regain about one third of their weight lost within 1 year, and they are typically back to baseline in 3 to 5 years [7, 8]. Furthermore, high attrition rates are common in traditional weight management programs, caused by time and travel demands [9, 10] or senses of shame that obese individuals could perceive attending treatment sessions delivered in face-to-face formats [11]. In addition, interventions may be not matched to participants’ individual needs [12]. Hence, developing effective long-term weight management programs that are time- and cost-saving, appealing and widely accessible as well as matched to the participants’ individual needs has become the main challenge in the treatment of overweight and obesity.

Internet-based Solution: Internet-based weight management programs show great promise for this challenge, because they have
the potential to overcome most of the limits associated with traditional weight-loss programs. They offer a number of novel opportunities for self-help programs and allow health care professionals to maintain long-term contact with large numbers of individuals in a time- and cost-saving manner [13]. Moreover, internet-based approaches allow for an individualized feedback and a tailoring intervention, matched to participants’ individual needs and prerequisites. Although the empirical evidence of such programs has been found inconsistent [14], systematic reviews recently pointed to the effectiveness of internet-based interventions in achieving significant weight loss and weight loss maintenance [15, 16]. However, the evidence of effectiveness is modest. Thus, it is important to prioritize well-designed efficacy trials that account for known sources of variation and determine which features of internet-based interventions are critical to achieve success in weight management.

Theory-based Solution: A prerequisite for suitable interventions is the establishment of a theoretical framework. Health behaviour theories help to predict, explain, and influence the mechanisms of health behaviour change [17]. Stages of change theories assume that the adoption and maintenance of health behaviours proceed through an ordered series of discrete stages. Individuals at different stages are characterized by different mindsets, delineated by differences in terms of their cognitions, perceived barriers and action tendencies. According to such theories, interventions can be matched to a person’s stage by targeting stage-specific needs [18]. These stage-matched interventions have the potential to bear more effective than ‘one size fits all’ interventions, and less costly, time-consuming, and reactance inducing because they have the potential to be more effective than ‘one size fits all’ interventions [19]. Stage-matched interventions derived from a theoretical framework such as the Health Action Process Approach (HAPA) [20, 21] would be directed at these proposed stage-specific social-cognitive variables. The HAPA has several principles. The first principle suggests that one should divide the health behavior change process into two phases (motivation and volition) in which people develop their intentions. There is a switch of mindsets when people move from deliberation to action. In the volition phase there are two groups of individuals: those who have not yet translated their intentions into action, and those who have. Thus, one can also create three categories of people with different mindsets: Preintenders, intenders, and actors. Intenders who are in the volitional preactional stage are motivated to change, but do not act because they might lack the right skills to translate their intention into action. Planning is a key strategy at this point. It can be divided into action planning and coping planning. Perceived self-efficacy is required throughout the entire process. As several randomized controlled trials have documented the evidence in favor of such interventions in the context of dietary behaviours [22, 23] as well as physical activity [24, 25], theory-based intervention programs that are delivered via the internet appear to be a novel and promising approach.

Prospects: Some of these considerations have also been incorporated in multiple health behavior change interventions in Germany. The presentation at the expert workshop will refer to one example of a web-based coach and will illustrate opportunities and challenges of such an approach.

References


Influence of an Encapsulated Fruit, Berry and Vegetable Juice Concentrate and Walking Exercise on Oxidative Stress and Skin Microcirculation in Overweight Women

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Introduction: Juice Plus+® (Memphis, Tennessee, USA), a whole food based nutraceutical, contains various phytochemicals like polyphenols, anthocyanins, carotenoids, vitamins and other compounds. Recent studies have demonstrated that this product improves skin microcirculation and reduces concentrations of oxidative stress markers at rest and post exercise in different cohorts of subjects [1, 2, 3]. But up to now overweight and/or obese women have not been investigated with this juice concentrate for aspects of oxidative stress and skin microcirculation in combination with postulated health-promoting exercise.

Methods: A randomized, double-blinded, placebo controlled clinical trial to observe the influence of Juice Plus+® supplementation on markers of oxidation and skin microcirculation at rest and post exercise was performed. The overweight and obese women (BMI: 28.4–39.8, stratified by weight between the study groups) were premenopausal (42 ± 5 years), non-smokers, and were recruited to perform a standardized 30 minutes treadmill walking test at 70% of VO2max before and after 8 weeks of supplementation with study capsules. Three fruit, berry, and vegetable capsules or placebo capsules were given twice per day (2x3 capsules with meals = 6 capsules daily). The markers of plasma oxidation we determined were: carbonyl proteins (CP), malondialdehyde (MDA), total oxidation status (TOS). Parameters of skin microcirculation were assessed at skin depths 1 mm and 8 mm: oxygen saturation of hemoglobin (SO2HB), relative concentration of hemoglobin (rHB), blood flow through skin capillaries (BF). Venous blood for oxidation markers were collected before and immediately after 30 minutes of walking exercise at 70% of individual VO2max. Microcirculation was measured by O2C-technique on the back of the wrist before and 10min post exercise. Individual VO2max was determined before the intervention period as part of eligibility testing. Subjects were instructed to wash-out four weeks from any supplements before the 1st exercise test/blood collection, to follow nutritional presets before each exercise testing/blood collection, and to avoid physical exercise training, weight loss and specific dietary regimens for the eight week duration of the nutraceutical intervention. Statistical analysis was performed via multifactorial analysis of variance (ANOVA, factors: treatment = comparison of supplementation versus placebo, time = pre vs. post exercise, exercise = walking test 1 vs. walking test 2). Level of significance was set at p<0.05.

Results: The presented results are interim results of an ongoing study with more than 40 overweight and obese women. Up to now we analysed parameters for 32 or 21 subjects. We found a significant reduction of TOS values in the supplemented group (N = 32, p<0.05), and a decrease in CP with a tendency (N = 21, p<0.059). There were no other influences observed on oxidation markers. SO2HB in 1 mm skin depth increased significantly in the supplemented group (N = 32, p<0.05). There was no influence of other factors on SO2HB in 1 mm skin depth. Exercise affected SO2HB significantly in 8 mm skin depth to increased values post exercise compared to pre exercise (N = 32, p<0.05). There was no other influence on this variable in 8 mm skin depth. rHB in 1 mm and 8 mm skin depth increased significantly from pre to post exercise (N = 32, p<0.05). No influence of other factors on rHB was observed. BF in 1 mm and 8 mm skin depth also increased significantly from pre to post exercise (N = 32, p<0.05) with no influence of other factors.

Conclusion: These data show that the nutraceutical decreased oxidation status in plasma and increased oxygenation of hemoglobin in the skin surface. Exercise also improved skin oxygenation and increased microcirculatory blood flow in the skin, with increased hemoglobin concentrations. We hypothesise that the juice concentrate exerted antioxidant effects to reduce oxidation and provided nutrients that stimulated NO-metabolism for better skin oxygenation. Exercise also affected NO-metabolism to increase skin oxygenation and skin microcirculation. However, in comparison to the effects of one single influencing factor (factor supplementation or factor exercise), this study also demonstrates a better beneficial outcome on redox homeostasis and skin microcirculation in overweight and obese women when both influencing factors are combined.

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