

Title:

Effect of Sensory-Based Intervention on the Increased Use of Food-Related Descriptive Terms among Restrained Eaters.

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Abstract

The goals of this pilot randomized controlled trial were to investigate and determine whether sensory-based intervention influenced the number and type of terms (descriptive and hedonic) used by restrained women to describe a certain food, and whether changes in the number of descriptive terms were associated with changes in intuitive eating. We collected data at baseline (T=1), at the end of the intervention period (T=2), and at 12 weeks post-intervention (T=3) using the descriptive form and Intuitive Eating Scale (IES). At T=1, 50 women were randomly assigned to an intervention group (sensory-based intervention) or a control group (waiting list). To determine the effect of intervention over time on the number of descriptive and hedonic terms, we conducted statistical analyses using mixed models. To determine associations between Intuitive Eating Scale subscales and the number of descriptive terms, we also calculated Spearman correlation coefficients. We noted a significant group-by-time interaction for descriptive terms associated with all senses ($p < 0.04$), except for a sight-related trend ($p = 0.06$). In comparison with T=1, intervention group women at T=2 and T=3 showed a significant increase in descriptive terms associated with smell ($p = 0.0002$ and $p = 0.03$ respectively), taste ($p = 0.001$ and $p = 0.01$ respectively) and hearing ($p = 0.04$ and $p = 0.0003$ respectively). Among intervention group women, we noted a positive correlation between changes (T=3 vs. T=2) in the number of descriptive terms used and changes in reliance on internal hunger and satiety cues at T=3 vs. T=2 ($r = 0.48$; $p = 0.04$), as well as between changes (T=3 vs. T=1) in the number of descriptive terms used and changes in unconditional permission to eat at ($r = 0.45$; $p = 0.05$). Overall, these data show that sensory-based intervention may help restrained women become more objective and enjoyably connected to food and their own bodies, which may promote a more intuitive approach to eating.

Abbreviations

BMI = Body Mass Index; IES = Intuitive Eating Scale

1. Introduction

A range of nutrition education campaigns have been undertaken to increase awareness of healthy food choices and promote the adoption of better eating practices (Health Canada, 2013).

However, it seems that information and awareness is not always sufficient to influence eating behaviours (Contento, 2008). A Canadian survey has shown that 40 percent of women feel overwhelmed by contradictory information on nutrition and lifestyle (Ipsos-Reid, 2008), which may lead to confusion and anxiety about food and eating (Fischler, 1994). Nutrition education that focuses mainly on knowledge often provides information only in terms of "good" or "bad" foods. Dichotomous thinkers do not factor complex options into their decision-making strategies, which oversimplifies the classification of foods and may lead to unhealthy eating behaviours (Freeland-Graves & Nitzke, 2013). From a sociological viewpoint, food cannot be reduced to a mere medical prescription to prevent disease, nor to a set of rules (Franchi, 2012). To promote healthy eating behaviours, alternative approaches are required.

While many nutrition education strategies are based on restrictive practices (avoidance of unhealthy foods, etc.), they often fail to allow for the sensory aspects of eating (pleasure associated with food, sensory experience, etc.) (Reverdy, 2011; Rozin & Gohar, 2011). Many studies have shown taste and food preferences to be determining factors in food choices (Contento, 2008; Freeland-Graves & Nitzke, 2013). An alternative to information-based strategies, sensory-based education includes both information and practical training by focusing on the senses (Reverdy, 2011). Unlike sensory training which is meant for expert analysts (wine,

etc.) (Reverdy, 2011), sensory education concerns the sense of taste in general and is meant for non-expert consumers. The effects of sensory education have been studied primarily on children. It has been suggested that sensory education lets children focus on their own sensations and responses rather than established or conventional responses (Reverdy, 2011). Children can indeed improve the description of their taste experience by using more descriptive than hedonic terms (Mustonen, Rantanen & Tuorila; Reverdy, Chesnel, Schlich, Köster & Lange, 2008). Sensory education can also enhance children's chemosensory awareness and heighten their awareness of food (Mustonen, Rantanen & Tuorila, 2009). These findings suggest this approach could increase awareness of eating and food, and make children more open to new experiences.

While the benefits of sensory education have been observed in children, one study has shown that sensory-based intervention (including sensory education) may be useful in improving certain eating-related attitudes and behaviours in restrained women (i.e. those with concerns about dieting and weight control) (Gravel, Deslauriers, Watiez, Dumont, Dufour Bouchard & Provencher, in press). Women who took part in the study showed an increase in unconditional permission to eat, based on the Intuitive Eating Scale or IES (i.e. they were less likely to ignore hunger signals, classify foods as "good" or "bad", and avoid foods viewed as "bad") (Tylka & Kroon Van Diest, 2013). Intuitive eating is based on physiological hunger and satiety cues rather than situational and emotional cues (Tylka, 2006; Tylka & Kroon Van Diest, 2013). In contrast with restrained eating, people who eat unconditionally are less likely to overindulge, engage in binge eating or experience guilt when eating (Polivy & Herman, 1999). Unconditional permission to eat thus seems healthy, and sensory-based intervention may be effective in helping restrained women focus on their own sensations rather than on dieting rules. A positive approach (based on

the pleasure of eating) has also proven more effective at changing behaviour than a restrictive approach, both in public nutrition messages (Freeland-Graves & Nitzke, 2013) and in a family context (Reverdy, 2011). IES is recommended for measuring a positive approach, since it can measure healthy food behaviours rather than just the lack of eating disorder symptoms (Tylka, 2006; Tylka & Kroon Van Diest, 2013). Based on these results, sensory-based intervention may be used as a tool to improve the eating-related experiences of restrained women. In particular, the more frequent use of descriptive rather than hedonic terms may promote a more intuitive approach to eating by helping these people to become more objective (unbiased) and enjoyably connected to food and their own bodies (by using their senses while eating), and to focus on non diet and weight related concerns.

The goals of this pilot randomized controlled trial were to investigate and determine whether sensory-based intervention influenced the number and type of terms (descriptive and hedonic) used by restrained women to describe a certain food, and whether changes in the number of descriptive terms were associated with changes in intuitive eating. We hypothesized that in contrast with restrained women from the control group, restrained women from the sensory-based intervention group would use more descriptive than hedonic terms to describe food. We also hypothesized that the use of more descriptive terms would be linked to higher levels of intuitive eating, but only for restrained women from the intervention group.

2. Methodology

2.1 Participants and Study Design

As previously noted (Gravel, Deslauriers, Watiez, Dumont, Dufour Bouchard & Provencher, in

press), women recruited for this study had to be concerned about dieting and weight control as measured by the Restraint Scale (Herman & Polivy, 1980). The study was a pilot randomized controlled trial in which women were randomly assigned to an intervention group (six, weekly 90-minute workshops) or a control group (waiting list) for an 18-week period. We took dependent variable measurements at baseline (T=1), at the end of the 6-week intervention period (T=2) and at 12-weeks post-intervention (T=3) (Fig. 1). We measured the weight and height of all participants after the descriptive form was completed, and then calculated BMI (kg/m²).

2.2 Intervention and Control Groups

Both groups have been described in detail (see (Gravel, Deslauriers, Watiez, Dumont, Dufour Bouchard & Provencher, in press). In the intervention groups (each consisting of 12 women), a registered dietitian conducted a sensory-based intervention during six weekly 90-minute workshops. We addressed specific themes in each of the six workshops (i.e. perceiving food through smell, touch, taste and hearing, etc.). Prior to food-tasting activities, participants were advised to avoid coffee, chocolate or other foods with a strong or persistent taste as well as perfumes, scented lotions and creams, as these could all affect sensory perception. Control group women were told to follow their usual lifestyle habits for the duration of the study. During the study period, these women had no contact with the research team except for post-treatment testing sessions (T=2 and T=3) like those of the intervention group. After the final testing session, at 12 weeks post-intervention (T=3), control group women were invited to take part in the sensory-based intervention on a voluntary basis. However, no data was collected for these women.

2.3 Tasting and Intuitive Eating Exercise

To determine the number and type of terms used to describe a food (i.e. descriptive and hedonic, etc.), women were invited to take part in a tasting exercise. Each woman was given a plate with two freshly baked oatmeal-raisin cookies, along with a questionnaire and a glass of water. The questionnaire contained the following instructions: "In your own words, please describe the food consumed during the tasting exercise." To avoid influencing the description, the experimenter gave no other instructions. After 10 minutes, the plate and questionnaire were removed. To process data from the questionnaire, two analysts used an inductive approach to develop a list of descriptive and hedonic terms (Bradley, Curry & Devers, 2007). They then each retrieved the data independently, and disagreements were resolved through consensus by holding in-depth discussions. For a more effective measurement, the ratio of descriptive terms (i.e. "these cookies are sweet") vs. hedonic terms (i.e. "these cookies are beautiful") was also calculated for each sense (Étiévant, Bellisle, Dallongeville, Etilé, Guichard, Padilla & Romon-Rousseaux, 2010). Women were asked to complete the validated 21-item IES, which includes three subscales: 1) unconditional permission to eat, defined as willingness to eat when hungry (i.e. not ignore hunger) and refusal to view certain foods as forbidden; 2) eating for physical rather than emotional reasons (i.e. to cope with emotional distress such as anxiety, loneliness, boredom, etc.); and 3) reliance on internal hunger and satiety cues, reflecting trust in and reliance on these cues to guide eating behaviour (Tylka, 2006; Tylka & Kroon Van Diest, 2013).

2.4 Statistical Analysis

To determine the effect of intervention over time on the number of descriptive and hedonic terms, as well as the ratio of descriptive vs. hedonic terms, we separately tested each component as a dependent variable in a repeated measures ANOVA (PROC MIXED, SAS), including group,

time, and group-by-time interaction as independent variables. We adjusted *P* values for $T=1$, and calculated Spearman correlation coefficients to determine links between IES subscales and the number of descriptive terms as well as the ratio of descriptive vs. hedonic terms. To determine the magnitude of change for observed differences within and between groups, we also calculated effect sizes (d =standardized difference, i.e. difference between means divided by pooled standard deviation) (Cohen, 1992). A *p* value <0.05 was considered statistically significant. For all statistical analyses, we used Statistical Analysis Software (Version 9.2, 2009, SAS Institute Inc.).

3. Results

3.1 Participants and Baseline Characteristics

As previously noted (Gravel, Deslauriers, Watiez, Dumont, Dufour Bouchard & Provencher, in press), 159 women were assessed for eligibility between January and September 2011 (Fig. 2). Of the 50 women randomized in this study, 24 were assigned to the intervention group and 26 to the control group. On the whole, participants were middle-aged (mean age of 47.5 ± 10.0 years) and slightly overweight (mean BMI of 27.7 ± 5.9 kg/m²), with high levels of restrained eating (mean of 17.5 ± 4.7). Most women had a university degree (56.0%) and an annual family income of more than \$59,999 (50.0%). Baseline characteristics for both groups have been previously described (Gravel, Deslauriers, Watiez, Dumont, Dufour Bouchard & Provencher, in press).

3.2 Differences in Number of Food-Related Terms

We found no group effect, time effect, or group-by-time interaction for hedonic terms associated with all senses. As shown in Table 1, we noted a significant group-by-time interaction for descriptive terms associated with all senses, except for a non-significant sight-related trend. We

also noted a significant group-by-time interaction for the ratio of descriptive vs. hedonic terms. In contrast with T=1, intervention group women at T=2 showed a significant increase in descriptive terms for touch ($p=0.003$; $d=0.66$), smell ($p=0.0002$; $d=0.99$), taste ($p=0.001$; $d=0.64$) and hearing ($p=0.04$; $d=0.64$), and in the ratio of descriptive vs. hedonic terms ($p=0.01$; $d=0.89$). Intervention group women at T=3 also showed a significant increase in descriptive terms for smell ($p=0.003$; $d=0.81$), taste ($p=0.01$; $d=0.49$), and hearing ($p=0.0003$; $d=0.77$). At T=2 we noted a significant difference between the intervention and control groups for descriptive terms associated with touch ($p=0.004$; $d=1.47$), smell ($p=0.0008$; $d=1.19$) and taste ($p<0.0001$; $d=1.01$), and for the ratio of descriptive vs. hedonic terms ($p=0.006$; $d=0.92$). At T=3, we also found a significant difference between groups for descriptive terms associated with touch ($p=0.02$; $d=1.41$), smell ($p=0.001$; $d=1.26$), taste ($p=0.0004$; $d=0.74$) and hearing ($p=0.009$; $d=0.77$).

3.3 Links between Descriptive Terms and Intuitive Eating

For intervention group women, we noted a positive correlation between changes (T=3 vs. T=2) in the number of descriptive terms used and changes in reliance on internal hunger and satiety cues to determine when and how much to eat ($r=0.48$; $p=0.04$). In analyzing T=3 vs. T=1, we also noted a positive correlation between changes in the number of descriptive terms used and changes in unconditional permission to eat (whenever hungry, and whatever food is desired) ($r=0.45$; $p=0.05$).

4. Discussion

To the best of our knowledge, this study is the first to try to determine whether sensory-based intervention can influence the number and type of terms used by restrained women to describe a

certain food, and whether the number of such terms is associated with intuitive eating. In keeping with the hypothesis, our findings show that sensory-based intervention can significantly increase the number of descriptive terms used to describe a certain food. Unlike hedonic terms, descriptive terms reflect an objectivity (or absence of judgment) about food, which can have advantages. We have noted that for children, the use of descriptive terms can enhance tasting and awareness of food (Mustonen, Rantanen & Tuorila; Reverdy, Chesnel, Schlich, Köster & Lange, 2008). Such improvements could be linked to heightened awareness among restrained women. Since restrained eaters may be guided chiefly by concerns about the food / weight relationship, the ability to describe food objectively may help them focus on concerns other than diet and weight. Having terms with which to express food preferences may also help restrained women identify and affirm these preferences and derive more satisfaction from eating. These findings support the view of the Academy of Nutrition and Dietetics that a proactive, positive and practical approach to eating can promote healthy behaviours (Freeland-Graves & Nitzke, 2013).

Sensory-based intervention also significantly increases the ratio of descriptive vs. hedonic terms. This ratio is a more effective measurement than the mere use of descriptive or hedonic terms, since for each additional descriptive term used, the number of hedonic terms remains unchanged (Étiévant, Bellisle, Dallongeville, Etilé, Guichard, Padilla & Romon-Rousseaux, 2010). As previously noted, the main difference between sensory trained and non sensory trained adults is quality of vocabulary, since they use effective and precise terms to describe a food or beverage rather than intensity or hedonic terms (Chollet & Valentin, 2001). Sensory education may help people overcome the hedonic stage by verbalizing their perceptions and making their descriptions more objective (Étiévant, Bellisle, Dallongeville, Etilé, Guichard, Padilla & Romon-Rousseaux,

2010). In France, dietitians have published observational data on the effectiveness of taste in discovering and satisfying one's own preferences (Menneteau & Kureta-Vanoli, 2009). In clinical practice, they found taste-related vocabulary to have a number of benefits (i.e. enhanced enjoyment, greater satiation, lower ingestion speed and food impulsivity, etc.) (Menneteau & Kureta-Vanoli, 2009).

In accordance with the hypothesis, study findings for intervention group women show the number of descriptive terms to be associated with two intuitive eating subscales. First, analyses of changes observed in the intervention follow-up (T=3 vs. T=2) showed a significant link between changes in the number of descriptive terms used and changes in reliance on internal hunger and satiety cues. This suggests that increased use of descriptive terms following sensory-based intervention may help guide the eating behaviour of restrained women by promoting awareness and trust in their internal hunger and satiety cues (Tylka & Kroon Van Diest, 2013). This is important, as those who do not trust or follow these cues may become unable to regulate food intake or more likely to experience dietary restraint, weight gain and emotional eating (Tylka & Kroon Van Diest, 2013). Similarly, between T=3 and T=1 we found associations between changes in the number of descriptive terms used and changes in unconditional permission to eat. Unconditional permission to eat reflects a refusal to view certain foods as forbidden (Tylka & Kroon Van Diest, 2013) and seems a healthy aspect of eating that should be supported (Freeland-Graves & Nitzke, 2013), especially among restrained women. Study findings suggest that the use of food-related descriptive terms may distract women from their habitual food and eating-related concerns (i.e. nutritional value of food, its anticipated effect on weight, etc.).

5. Conclusions

In conclusion, preliminary data show that sensory-based intervention increases the number of descriptive terms used to describe a food, which may in turn help restrained women become more objective and enjoyably connected to food and their own bodies (as suggested by the positive correlation between changes in the number of eating-related descriptive terms and changes in IES subscales, i.e. reliance on internal hunger and satiety cues, unconditional permission to eat, etc.). These findings support the need to further explore the effects of sensory education, to determine if sensory based-intervention is an effective strategy to help restrained women develop a more intuitive approach to dieting.

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7. Author Contributions

The contributions of each author are as follows: Study concept: KG and VP; Food tasting intervention design: KG, VP, AD, MW, MD and AADB; Workshop recruitment, testing and

moderation: KG; Data analysis and interpretation: KG, VP and GOSH; Drafting of manuscript: KG and VP; Critical review of manuscript: KG, GOSH, AD, MW, MD, AADB and GOSH.

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Highlights

- Sensory-based intervention increases the use of descriptive terms.
- Descriptive terms and reliance on hunger and satiety cues are positively associated.
- Descriptive terms and unconditional permission to eat are positively associated.
- Sensory-based intervention may help restrained women to be more objective about food.
- Sensory-based intervention may facilitate a more intuitive approach to eating.

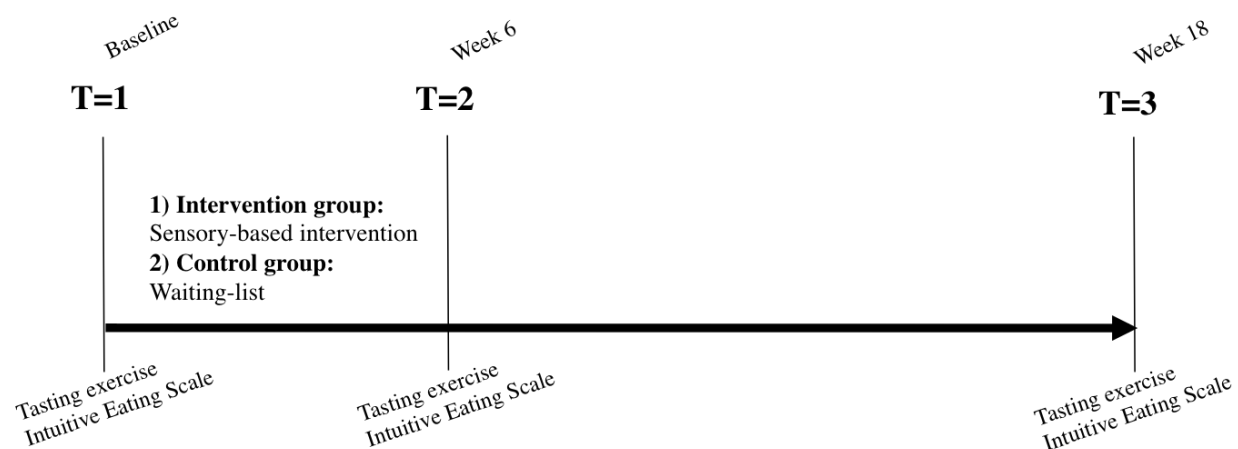


Figure 1. Study design

At T=1, women (n=50) were randomly assigned to: 1) intervention group (six weekly 90-minute workshops conducted by a registered dietitian; n=24); or 2) waiting-list control group (n=26).

Measurements were taken at baseline (T=1), at the end of the 6-week intervention period (T=2), and at 12-week post-intervention (T=3). Measurements were taken three times over an 18-week period.

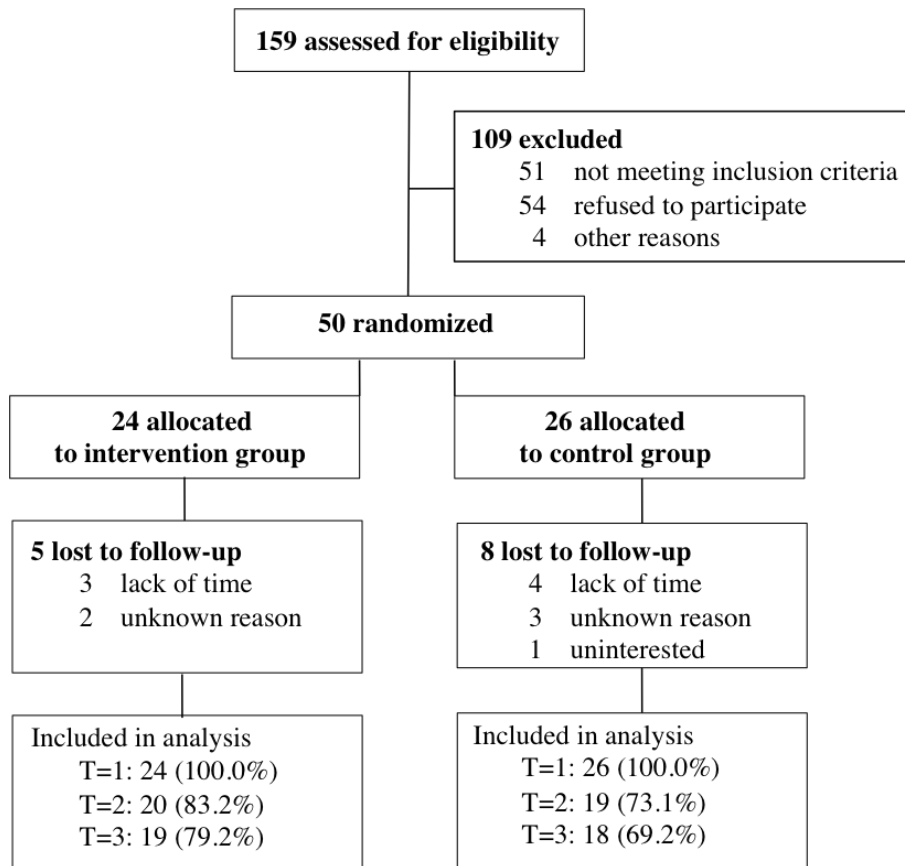


Figure 2. Trial profile.

Table 1. Number of food-related descriptive terms for each sense mentioned during taste-rating task in the intervention and control groups, before and after the sensory-based intervention.

Number of food-related descriptive <u>terms</u>	<u>Intervention</u>	<u>Control</u>	<u>Differences between groups</u>	
	Means \pm SD	Means \pm SD	Effect	P value
Words associated with sight				
T=1	0.58 \pm 1.21	0.42 \pm 1.17	Group	0.0051
T=2	1.05 \pm 1.54	0.37 \pm 1.01	Time	0.0038
T=3	1.74 \pm 1.56	0.50 \pm 0.79	Time * group	0.0635
Words associated with touch				
T=1	2.42 \pm 2.73	1.19 \pm 1.30	Group	0.0001
T=2	4.15 \pm 2.52	1.21 \pm 1.27	Time	0.0084
T=3	3.16 \pm 1.61	1.11 \pm 1.28	Time * group	0.0379
Words associated with smell				
T=1	0.58 \pm 0.97	0.27 \pm 0.96	Group	< 0.0001
T=1	1.80 \pm 1.44	0.32 \pm 1.00	Time	0.0012
T=2	1.53 \pm 1.35	0.17 \pm 0.71	Time * group	0.0036
Words associated with taste				
T=1	2.17 \pm 1.83	2.27 \pm 1.91	Group	< 0.0001
T=2	3.55 \pm 2.46	1.58 \pm 1.22	Time	0.3277
T=3	3.16 \pm 2.19	1.72 \pm 1.67	Time * group	< 0.0001
Words associated with hearing				
T=1	0	0	Group	0.0076
T=2	0.25 \pm 0.55	0	Time	0.0066
T=3	0.42 \pm 0.77	0	Time * group	0.0066
Total of descriptive words for all senses				
T=1	5.75 \pm 4.69	4.15 \pm 4.04	Group	< 0.0001
T=2	10.80 \pm 4.62	3.47 \pm 3.13	Time	0.0005
T=3	10.00 \pm 3.92	3.50 \pm 2.98	Time * group	< 0.0001
Ratio number of descriptive/hedonic words				
T=1	2.73 \pm 2.15	2.73 \pm 2.15	Group	0.0005
T=2	5.68 \pm 4.17	5.68 \pm 4.17	Time	0.0229
T=3	4.28 \pm 3.22	4.28 \pm 3.22	Time * group	0.0429

Values are the mean \pm standard deviation (SD). P-values are adjusted for T=1. T=1: intervention group (n=24); control group (n=26). T=2: intervention group (n=20); control group (n=19). T=3: intervention group (n=19); control group (n=18).