



Implementation Intention Strategy to Reduce Salt Intake among Heart Failure Patients: A Randomized Controlled Trial L'activation de l'intention visant à réduire la consommation de sel chez les patients atteints d'insuffisance cardiaque : un essai contrôlé randomisé

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Article abstract

Introduction: An Implementation Intention strategy might be effective in transforming a positive intention to reduce salt intake into effective action among heart-failure patients. **Objective:** To assess the potential efficacy of an Implementation Intention intervention to reduce salt intake among heart-failure patients. **Methods:** Randomized controlled trial. The 60 heart-failure patients recruited were first randomized into 2 groups: an experimental group (EG) and a control group (CG). The study population was further broken down into 4 groups depending on whether the individuals prepared their own meals: 2 individual groups (EG-Individual and CG-Individual); and 2 collaborative groups, involving the patient and a social referent (EG-Collaborative and CG-Collaborative). The experimental groups developed action and coping plans based on the Implementation Intention. Total salt intake was calculated through discretionary salt, sodium-food frequency questionnaires, and 24-hour recall, obtained at the baseline (T0) and at the 2-month follow-up (T3). **Results:** 56 patients ended the follow-up. A reduction in the total salt intake was observed in the EGs (Individual and Collaborative) compared to baseline (5.04g/day vs. 12.21g/day for the EG-Individual ($p \leq 0.001$); 4.79g/day vs. 11.43g/day for the EG-Collaborative; $p \leq 0.001$). The multivariate analysis showed that the 2 EGs had lower salt intake at T3 than the 2 CGs (95% CI 4.19-9.29 for individual groups vs. 95% CI 4.84-10.22 for collaborative groups). There were no differences between the 2 EGs (95% CI -2.77 to 2.41). The total variance explained (R²) by these comparisons was 0.70. **Discussion and conclusion:** This study suggests that Implementation Intention might be effective in reducing salt intake among heart-failure patients, either individually or collaboratively. Further research testing mediator and moderator effects of the psychosocial variables are recommended.





Implementation Intention Strategy to Reduce Salt Intake among Heart Failure Patients: A Randomized Controlled Trial

L'activation de l'intention visant à réduire la consommation de sel chez les patients atteints d'insuffisance cardiaque : un essai contrôlé randomisé


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Keywords

health plan implementation;
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controlled trial

Abstract

Introduction: An Implementation Intention strategy might be effective in transforming a positive intention to reduce salt intake into effective action among heart-failure patients. **Objective:** To assess the potential efficacy of an Implementation Intention intervention to reduce salt intake among heart-failure patients. **Methods:** Randomized controlled trial. The 60 heart-failure patients recruited were first randomized into 2 groups: an experimental group (EG) and a control group (CG). The study population was further broken down into 4 groups depending on whether the individuals prepared their own meals: 2 individual groups (EG-Individual and CG-Individual); and 2 collaborative groups, involving the patient and a social referent (EG-Collaborative and CG-Collaborative). The experimental groups developed action and coping plans based on the Implementation Intention. Total salt intake was calculated through discretionary salt, sodium-food frequency questionnaires, and 24-hour recall, obtained at the baseline (T_0) and at the 2-month follow-up (T_3). **Results:** 56 patients ended the follow-up. A reduction in the total salt intake was observed in the EGs (Individual and Collaborative) compared to baseline (5.04g/day vs. 12.21g/day for the EG-Individual ($p \leq 0.001$); 4.79g/day vs. 11.43g/day for the EG-Collaborative; $p \leq 0.001$). The multivariate analysis showed that the 2 EGs had lower salt intake at T_3 than the 2 CGs (95% CI 4.19-9.29 for individual groups vs. 95% CI 4.84-10.22 for collaborative groups). There were no differences between the 2 EGs (95% CI -2.77 to 2.41). The total variance explained (R^2) by these comparisons was 0.70. **Discussion and conclusion:** This study suggests that Implementation Intention might be effective in reducing salt intake among heart-failure patients, either individually or collaboratively. Further research testing mediator and moderator effects of the psychosocial variables are recommended.

Résumé

Introduction : La stratégie de l'Activation de l'Intention peut constituer une intervention efficace pour réduire la consommation de sel chez les patients atteints d'insuffisance cardiaque (IC). **Objectif :** Évaluer l'efficacité potentielle d'une intervention basée sur l'Activation de l'Intention pour réduire la consommation de sel chez les patients atteints d'IC. **Méthodes :** Essai contrôlé randomisé. Les 60 patients atteints d'IC recrutés ont été randomisés en deux groupes : Expérimental (GE) et Contrôle (GC). Ensuite, selon que les individus préparaient leurs propres repas ou qu'un référent social était responsable de cette préparation, ils ont été répartis en GE-Individuel, GC-Individuel et en GE-Collaboratif, GC-Collaboratif. La consommation de sel a été mesurée à partir du sel discrétionnaire, du questionnaire de fréquence de consommation de sodium et du rappel de 24 heures, et ce au temps de référence (T_0) et au suivi à 2 mois (T_3). **Résultats :** 56 patients ont complété le suivi. Une réduction de l'apport total en sel a été observée dans les GE (Individuel et Collaboratif) comparativement à T_0 (GE-Individuel : 5,04g/jour vs 12,21g/jour ; GE-Collaboratif : 4,79g/jour vs 11,43g/jour, $p \leq 0.001$). L'analyse multivariée a montré que les GE ont présenté une plus faible consommation de sel à T_3 que les GC (95% IC 4,19-9,29 pour les groupes individuels vs 95% IC 4,84-10,22 pour les groupes collaboratifs). Aucune différence n'a été constatée entre les GE (95% IC -2,77 à 2,41). La variance totale (R^2) expliquée par ces comparaisons était de 0,70. **Discussion et conclusion :** L'Activation de l'Intention peut être efficace pour réduire la consommation de sel chez les patients atteints d'IC, individuellement ou en collaboration avec un référent social. D'autres recherches testant les effets médiateurs et modérateurs des variables psychosociales sont recommandées.

Mots-clés

mise en œuvre de programmes de santé; insuffisance cardiaque; chlorure de sodium alimentaire; soins infirmiers; essai contrôlé randomisé

INTRODUCTION

The recommended healthy salt intake for adults in the general population should not exceed 5 grams (g) per day (World Health Organization, 2012) because of the clear benefits to cardiovascular health from having a healthier salt intake (He et al., 2020). However, worldwide salt intake exceeds the recommendations (Mill et al., 2019; Perin et al., 2019; Thout et al., 2019).

With respect to heart failure (HF), there is a major debate about the evidence that would support severe restriction of dietary sodium, resulting in a lack of consensus on the optimal level of sodium intake for these patients (Khan et al., 2020). At the same time, it is widely accepted that a high sodium diet—as observed in the general population worldwide—is not appropriate for HF patients (Ezekowitz et al., 2017; National Institute for Health and Clinical Excellence, 2018; NHFA CSANZ Heart Failure Guidelines Working Group, 2018; Seth et al., 2017; Scottish Intercollegiate Guidelines Network, 2016; Yancy et al., 2017).

Reducing salt intake is challenging because of the hedonic aspects implicit in the act of eating. Thus, intervention programs aimed at promoting a healthier salt intake among these patients are needed as part of promotion self-care. Self-care is a key concept in nursing, as stated in conceptual models such as the Dorothea Orem's Self-Care Deficit Theory (SCDT). The SCDT postulates that self-care consists of actions that individuals freely and purposefully initiate and perform for themselves in maintaining life, health, and well-being. The nurse's actions are directed toward assisting the patient to assume responsibility for self-care (Orem, 2001). The situation-specific theory of heart failure self-care (Riegel et al., 2008), which gave rise to the middle-range theory of self-care in chronic illness (Riegel et al., 2012), specifies the concepts, assumptions, propositions, and factors affecting self-care in the specific context of HF. Knowledge, although important, is not enough to push patients to undertake self-care, as it is not always translated into effective behaviour.

The Implementation Intention strategy has been demonstrated to be effective in supporting

behaviour change (Sniehotta et al., 2005; Wieber et al., 2015). It targets supporting better goal attainment in behaviour modification. It is subordinate to goal intentions as it specifies the when, where, and how portions of goal-directed behaviour, making the bridge between intention and behaviour (Sniehotta et al.; Wieber et al.). Regarding eating behaviours, the literature reports the successful use of Implementation Intention in promoting healthy eating (Adriaanse et al., 2011), assisting individuals to increase the intake of vegetables and fruits (Kendzierski et al., 2015), decrease the intake of saturated fats and snacks (Churchill et al., 2019) and reducing global fat intake (Vilà et al., 2017).

In the Brazilian context, this strategy was also used to reduce salt intake among hypertensive women. Agondi's study (2014) was one of the first to use this strategy in the specific clinical context of hypertension, including patients with low incomes and education levels. Nonetheless, one limitation was that only women responsible for preparing their own meals were enrolled. Men and women who were not responsible for preparing their own meals were excluded. However, people living with hypertension are not always responsible for preparing their own meals. From this important standpoint, applying the strategy of Implementation Intention collaboratively—including the participation of a social referent responsible for the meal preparation—offers the possibility of a more inclusive approach.

In fact, literature indicates that collaborative intervention might be even more effective than individual application. The social support provided by the social referent involved facilitating integration of self-care in the patient's normal daily routines (Clark et al., 2013, Davies et al., 2017; Prestwich et al., 2012). Accordingly, using a collaborative strategy for Implementation Intention related to salt-intake behaviour among HF patients could provide important information about the wider use of this intervention in clinical settings.

OBJECTIVE

Therefore, the main objective of this study was to assess the potential effect of a nursing intervention based on Implementation Intention

related to dietary salt intake when offered individually or collaboratively to HF patients. The effects of the intervention on intention, habit and self-efficacy related to the target behaviour were also investigated.

METHODS

TRIAL DESIGN

This was a randomized controlled trial with a 2-month follow-up. The TIDieR checklist and guide (Hoffmann et al., 2014) were used to report the intervention in sufficient detail to allow their replication. The recruitment was conducted from October to December 2012 and the follow-up from January to March 2013.

PARTICIPANTS AND RANDOMIZATION

The target population consisted of HF patients and their social referents at primary-care clinics in the Brazilian family health strategy of the unified public system in a town with a population of 1,000,000 inhabitants in southeast Brazil. Patients included had been in clinical follow-up for HF for at least 6 months, were aged between 18 and 90 years, and were in New York Heart Association (NYHA) functional classes I to III. Patients hospitalized for HF in the month preceding the recruitment period, those presenting cognitive or psychological impairments documented in their medical records precluding effective communication, and participants without a telephone for the follow-up were excluded.

Inclusion criteria for the social referents were being responsible for preparing meals for the HF patient and being available to attend nursing appointments with the patient during the study. Potential participants were identified from patient records. If the data indicated they were eligible, they were contacted and invited to join the study. The health clinic had 143 heart-failure patients in a follow-up and 24 of them met exclusion criteria. Out of the total, we were able to contact 76 patients to invite them to take part in the study: 60 accepted. Thus, a sample of 60 patients was recruited: 30 patients in the experimental group (EG) and 30 in the control group (CG).

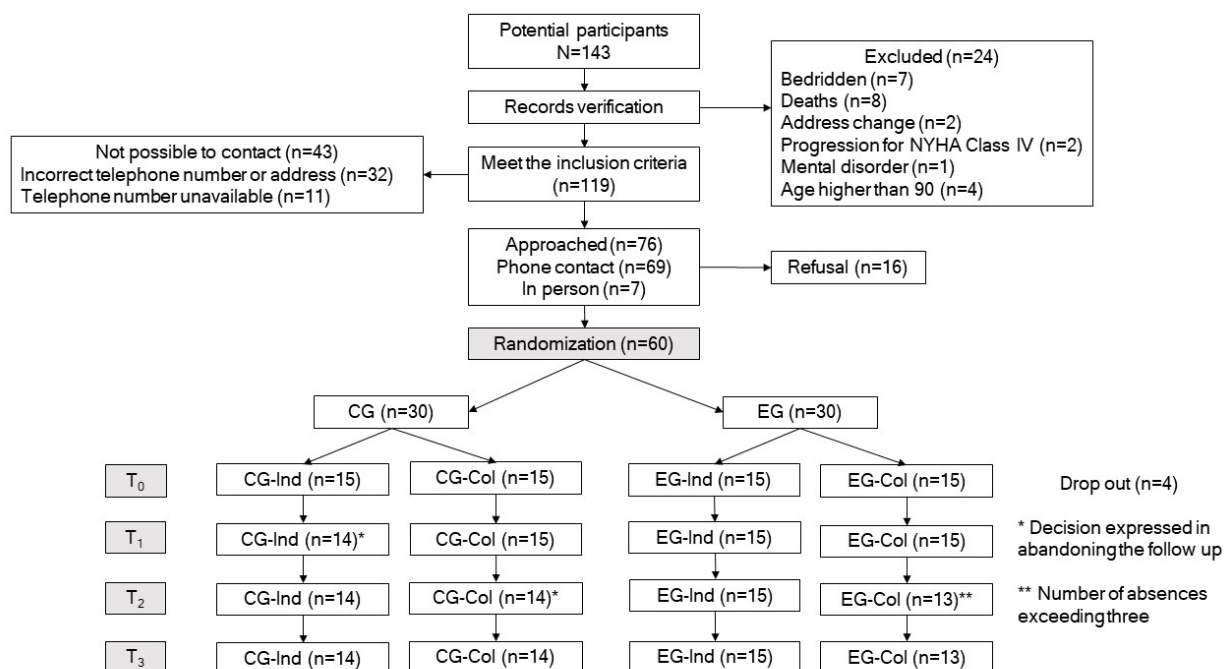
Figure 1 provides the recruitment, randomization, and drop out procedures. The process for assigning participants to the four groups entailed two phases. In Phase 1, participants were randomly allocated in control (CG) or experimental group (EG) according to a sequence listing generated by SAS software version 9.1.3, assuring an equivalent distribution of the sample population. In Phase 2, the principal investigator (ATN) assessed who was responsible for preparing meals at home.

When the participant was responsible for preparing their own meals, they were assigned to the individual experimental group or individual control group (EG-Individual, CG-Individual). When the social referent prepared meals at home, the participant was assigned to the experimental collaborative group or control collaborative group (EG-Collaborative; CG-Collaborative).

The outcome assessor collecting data at T_0 and T_3 was blinded for randomization.

Figure 1

Participant and Randomization Flow Diagram (Final Sample n = 56)



THE INTERVENTION

The intervention aimed at drawing up action and coping plans to reduce salt use during and after meal preparation in the daily life heart-failure patients. The target behaviour considered for this study was the intake of up to 5 g of salt per day (approximately 1 teaspoon).

Action planning consists of thinking about when, where, and how the patients could change the target behaviour based on their daily routine. Coping planning aims at “protecting” the target behaviour, helping patients to reflect upon the barriers that might appear during the behaviour-change process and the strategies to overcome them (Sniehotta et al., 2005). Then, through the association of action and coping planning, we expected that the patients could significantly reduce the addition of salt during and after meal preparation in the following 2 months.

The intervention consisted of two face-to-face meetings and two telephone contacts. The first

meeting served to develop the action and coping plans (a copy each for the participant and investigator) according to recommendations of Sniehotta et al. (2005). The second meeting served to reinforce the plans and adjust to the patient’s daily routine, if necessary. The two telephone contacts aimed at reinforcing the elaborated plans.

In broaching the action plan during the first meeting (T₁), the investigator introduced the topic of salt intake and oriented the patient to think about their eating routine over the following 2 months. After that, the investigator asked: “When, where, and how do you plan to reduce the addition of salt during and after meal preparation?” Then, the investigator reminded the patient of the importance of considering individual and family daily routines: “The more precise and realistic you are in determining your plans, the more likely you are to be able to implement them!” The patients were then given a three-column table (when, where, and how) for use in specifying up to three action plans.

At that point, the participants were invited to identify and to write down up to three possible obstacles that might hinder the implementation of these actions and the strategies that might be used to overcome them. The introductory question was: "Think about the obstacles or barriers that might interfere with reducing your salt intake: How might you overcome these obstacles or barriers?" The patients were then given a two-column table (barriers, strategies to overcome) to develop up to three coping plans. In cases of writing skills limitations, the nurse has filled the planning tables for the patient, considering the dialogue during the plan's elaboration. The authors consulted the Agondi's et al. study (2012) to support the plan development. At the end of the first meeting, patients left with a copy of the developed plans and were encouraged to maintain a strong commitment to act as planned. During the second meeting (T_2), which occurred 30 days after T_1 , the principal investigator reinforced the plans with the patient (EG-Individual) or the patient and the social referent (EG-Collaborative). The dialogue between patient and investigator started with the questions: "How well are you managing to stick to your plans? Do you think any adjustments are needed?" Each plan was assessed with the participant from the standpoint of feasibility and level of success. The plans were modified according to participants' needs to help them achieve the target behaviour. Two telephone contacts were made 15 days after T_1 and 15 days after T_2 to reinforce the action and coping plans, but no changes were made at this stage. The telephone calls lasted approximately 10 minutes.

The intervention was conducted by the principal investigator (ATN), who is a registered nurse and has expertise in nursing consultations and following up patients with cardiovascular diseases in primary care. As a training, the investigator developed the intervention under supervision of the other authors with five hypertensive patients who were not enrolled in this study.

The investigator met with the patient (EG-Individual) or the patient and the social referent (EG-Collaborative) in a consultation office at the primary-care health clinic for confidentiality with two-way printed tables available in Nunciaroni's

study (2013). In the collaborative experimental group, the investigator encouraged patients and social referents to develop the action and coping plans together. The patients in both experimental groups (EG-Individual and EG-Collaborative) were contacted by telephone.

Development of action and coping plans took about 40 minutes; the second follow-up meeting lasted about 20 minutes. The content of the plans produced is described in detail elsewhere (Nunciaroni et al., 2021).

DATA COLLECTION PROCEDURE

Before data collection at T_0 , the study was explained in detail to the participants. They were invited to sign the consent form and completed the questionnaires. After the randomized groups had been formed, an appointment was scheduled according to the convenience of the patients and social referents within a 7-10-day interval at the primary-care health clinic. In the case of the EG, the intervention was applied.

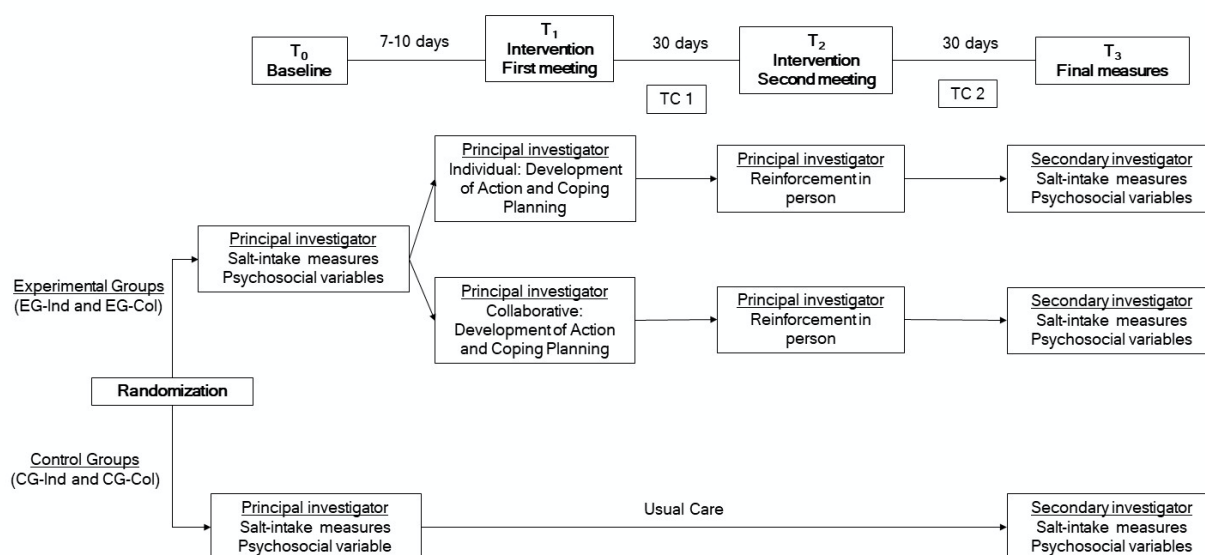
For the CG, a nursing consultation for usual care was provided. The usual care for heart-failure patients in the primary-care health clinic consists of alternating medical and nursing consultations every 3 to 4 months. This follow-up includes evaluation of symptoms and clinical signs of decompensation, the drug therapy and its adherence, assessment of renal and cardiac function, and general guidance on dietary behaviours and physical activity. Despite these interventions are based on the Brazilian guideline (Comitê Coordenador da Diretriz de Insuficiência Cardíaca, 2018), the usual care does not include specific actions aimed at altering salt intake among this population.

At T_0 , information on the sociodemographic variables of the patients and social referents was obtained. The salt intake was assessed based on self-assessment questions. One week later (T_1), the EG patients came back to the clinic for individual or collaborative intervention.

Final measures were obtained during a meeting at the clinic between 67 and 70 days after T_0 (T_3) by an outcome assessor blinded to randomization. Figure 2 illustrates data collection. Both EG and CG received usual care from the local family-health strategy team.

Figure 2

Intervention and Data-Collection Procedure 2-month Follow-up



Note. TC: Telephone contact.

VARIABLES AND OUTCOMES

The primary outcome was the total salt intake assessed by the sum of three self-reporting methods: discretionary salt (salt per capita; that is salt addition during and after meal preparation), sodium food frequency questionnaire-Na-FFQ (intake of foods with high sodium content), and 24-hour recall (intrinsic sodium) (Ferreira-Sae et al. [2009] found that the combination of Na-FFQ and 24-hour recall was correlated at 0.23, *p*-value of 0.02 with urinary sodium excretion, which is the gold standard measure of salt intake). The secondary endpoints were the psychosocial variables: intention, a 6-item instrument (Cronbach’s alpha of 0.82), and self-efficacy, a 3-item questionnaire (Cronbach’s alpha of 0.97) related to the use of a teaspoon of salt a day, and the habit of using more than one teaspoon of salt a day a 10-item questionnaire (Cronbach’s alpha of 0.93) (Cornélio et al., 2009). All the answers were disposed in a Likert scale ranging from definitely no to definitely yes (1 to 5).

All variables were obtained at baseline (T₀) and 2-month follow-up (T₃).

DATA ANALYSIS

Linear regression models were applied to assess group differences in salt intake and each of the psychosocial variables (Montgomery & Peck, 1982). In these models, the three measures of salt intake and related psychosocial variables at the end of the follow-up were considered as dependent variables, while the groups and the interaction term between them were deemed independent variables. Also, the same variables (discretionary salt, Na-FFQ and 24-hour recall) at T₀ was added as the control in the statistical model.

The nonparametric Mann–Whitney tests and the sum of Wilcoxon Signed Posts were used for simple comparisons among groups and time for the measures of salt consumption (Pagano & Gauvreau, 2004).

A 95% Confidence Interval was adopted for all analyses.

ETHICAL CONSIDERATIONS

This study was approved by the university and municipality ethical committees (30390 on June 1, 2012, and 174969 on December 12, 2012). All participants (patients and social referents) signed the written informed consent form. The study is registered with the Brazilian record of clinical trials (RBR-7mty35; UTN: U1111-1245-5024).

RESULTS

Of the 60 HF patients recruited, 56 completed the study (28 men and 28 women) (Table 1). The mean age of the sample is 67.6 (\pm 9.9) years, and the level of education and socioeconomic status were low (3.5 ± 2.5 years of schooling and US\$ 405 per family monthly, respectively).

The individual groups were composed mostly of women (27/28). Most of the patients in the collaborative groups ($n=28$) were men (27/28); the main social referent responsible for meal preparation was the wife (85.2%).

INTERVENTION RESULTS

A significant reduction in salt intake was observed in the experimental groups at the final follow-up (T_3) when compared to the baseline, while the control groups maintained their salt intake at levels close to those observed at T_0 (Table 2).

In both EG-Individual and EG-Collaborative, the reduction of the total salt intake was due mainly to reducing salt addition during and after meal preparation (discretionary salt) and reducing the intake of foods with high sodium content

(NaFFQ). Moreover, a reduction in intrinsic sodium was also observed in the collaborative experimental group (24-hour recall).

As for the psychosocial variables, both EG-Individual and EG-Collaborative exhibited a significant reduction in their mean habit scores when comparing T_0 and T_3 , pointing to a decrease in the unconscious act of adding more than a teaspoon of salt to food per day. With respect to the mean self-efficacy score, the CG-Collaborative achieved a significant decrease, whereas the experimental groups (EG-Individual and EG-Collaborative) showed increases. With regard the intention score, the patients included in experimental groups (EG-Individual and EG-Collaborative) presented significant increases at T_3 , despite the high scores obtained in T_0 .

Table 3 presents the results of the linear regression models to assess the effect of the intervention on salt-intake measures and psychosocial variables at the end of the follow-up in order to compare the four groups. The multivariate analysis showed that the 2 EGs had lower salt intake at T_3 than the 2 CGs (95% CI 4.19-9.29 for individual groups vs. 95% CI 4.84-10.22 for collaborative groups). There were no differences between the 2 EGs (95% CI -2.8 to 2.4). The total variance (R^2) explained by the model was 0.70.

The results suggest that intention and self-efficacy increased significantly in both experimental groups, whereas they remained stable in the control groups (Table 3). Also, the significant reduction in the habit score in the experimental groups suggests that the intervention prevented the automatic behaviour of adding salt during and after meal preparation (Table 3).

Table 1*Sociodemographic, Clinical Characteristics, Salt Consumption and Psychosocial Variables at baseline (T₀) (n=56)*

Variable	Total (n=56)	Control (n=28)	Experimental (n=28)
Age (years) - mean (SD)	67.6 (9.9)	67.2 (9.6)	68 (10.3)
Sex (Female) - n (%)	28 (50.0)	13 (46.4)	15 (53.6)
Education (years)^a - mean (SD)	3.5 (2.5)	3.6 (2.6)	3.5 (2.8)
Professional status (Retired) - n (%)	33 (58.9)	16 (57.2)	17 (60.7)
Living status (With a partner) - n (%)	38 (67.9)	19 (67.9)	19 (67.9)
Family monthly income (US\$ dollars) - mean (SD)	418.1 (1.4)	418.1 (1.4)	418.1 (1.4)
Length of HF diagnosis (years) - mean (SD)	4.8 (6.7)	5.4 (7.7)	4.2 (5.6)
Systolic blood pressure (mmHg) - mean (SD)	127.0 (16.5)	127.1 (16.8)	126.9 (16.5)
Diastolic blood pressure (mmHg) - mean (SD)	79.0 (11.1)	78.2 (11.8)	79.9 (10.5)
HF Etiology (Hypertensive) - n (%)	40 (71.4)	19 (67.8)	21 (75.0)
NYHA Functional Class (I) - n (%)	44 (78.6)	21 (75.0)	23 (82.1)
Dysfunction type (Diastolic) - n (%)	48 (85.7)	23 (82.1)	25 (89.3)
Body Mass Index - mean (SD)	28.5 (5.0)	27.4 (4.5)	29.7 (5.2)
Waist circumference (cm) - mean (SD)	99.7 (10.1)	98.2 (12.5)	101.2 (8.6)
Number of medications in use - mean (SD)	3.6 (1.3)	3.4 (1.2)	3.7 (1.4)
Number of HF symptoms - mean (SD)	1.6 (1.5)	1.6 (1.4)	1.6 (1.7)
Discretionary salt (g of salt/ day) - mean (SD)	6.8 (3.4)	6.6 (2.9)	7.0 (4.0)
Na-FFQ (g of salt/ day) - mean (SD)	2.7 (2.8)	3.2 (3.3)	2.1 (2.0)
24-hour Recall (g of salt/ day) - mean (SD)	2.6 (2.7)	2.5 (1.8)	2.7 (3.3)
Total Salt (g of salt/ day) - mean (SD)	12.1 (5.8)	12.3 (5.8)	11.8 (6.0)
Habit - mean (SD)	3.7 (0.9)	3.8 (0.9)	3.5 (1.0)
Intention - mean (SD)	4.0 (0.7)	3.8 (0.9)	4.3 (0.3)
Self-efficacy - mean (SD)	3.8 (0.8)	3.4 (0.9)	4.2 (0.4)

^a Starting from the first year of the elementary school. SD: Standard deviation; Na-FFQ: Sodium Frequency Food Questionnaire. HF: Heart Failure; NYHA: New York Heart Association.

Table 2

Salt Consumption and Psychosocial Variables for Experimental and Control Groups at the Baseline and the End of the Follow-up (n=56)

Variables		Control Group (n=28)						Experimental Group (n=28)					
		Individual (n=14)			Collaborative (n=14)			Individual (n=15)			Collaborative (n=13)		
		Mean (SD)	Median	p-value ^a	Mean (SD)	Median	p-value ^a	Mean (SD)	Median	p-value ^a	Mean (SD)	Median	p-value ^a
Salt Consumption													
Discretionary salt	T ₀	5.85 (2.61)	5.56	0.624	7.41 (3.17)	6.36	0.812	7.07 (4.67)	5.98	0.002	6.87 (3.17)	7.40	0.006
	T ₃	5.67 (2.16)	5.56		7.42 (3.37)	5.56		3.15 (1.31)	3.33		3.08 (1.02)	2.78	
Na-FFQ	T ₀	2.0 (3.47)	1.28	0.401	4.43 (2.85)	4.04	0.463	1.94 (1.91)	1.33	<0.001	2.40 (2.31)	1.71	<0.001
	T ₃	2.76 (5.27)	0.92		3.95 (2.99)	2.89		0.23 (0.21)	0.19		0.21 (0.19)	0.17	
24-hour Recall	T ₀	1.94 (1.22)	1.76	>0.99	3.03 (2.23)	1.97	0.807	3.19 (4.50)	2.42	0.107	2.17 (1.05)	1.79	0.004
	T ₃	2.02 (1.09)	1.75		2.83 (1.49)	2.26		1.66 (0.74)	1.62		1.50 (0.64)	1.62	
Total Salt	T ₀	9.79 (6.05)	8.26	0.669	14.87 (4.40)	14.12	0.267	12.21 (6.99)	9.90	<0.001	11.43 (4.79)	10.88	0.001
	T ₃	10.44 (7.50)	8.97		14.21 (4.84)	11.94		5.04 (1.71)	5.08		4.79 (1.19)	5.19	
Psychosocial Variables													
Habit	T ₀	3.99 (0.95)	4.30	0.307	3.61 (0.84)	3.95	0.008	3.06 (1.17)	3.40	< .001	4.05 (0.37)	4.10	0.002
	T ₃	4.09 (1.08)	4.55		4.12 (0.69)	4.05		1.20 (0.24)	1.10		1.20 (0.19)	1.20	
Intention	T ₀	3.86 (0.88)	4.00	0.372	3.73 (0.98)	4.00	0.443	4.33 (0.41)	4.33	0.002	4.33 (0.29)	4.33	0.003
	T ₃	4.04 (0.72)	4.17		3.61 (0.69)	3.50		4.91 (0.15)	5.00		4.88 (0.11)	4.83	
Self-efficacy	T ₀	3.41 (1.02)	3.33	0.281	3.50 (0.91)	4.00	0.013	4.18 (0.52)	4.00	0.001	4.26 (0.34)	4.00	0.001
	T ₃	3.19 (1.03)	3.33		2.69 (1.03)	2.00		5.00 (0)	5.00		4.95 (0.13)	5.00	

Note. SD: Standard Deviation; Na-FFQ: Sodium Frequency Food Questionnaire. ^ap-value obtained by the test sum of Wilcoxon Signed Posts, comparing T₀ and T₃.

Table 3

Salt Consumption and Psychosocial Variables for the Intervention and the Control Groups at the Final Follow-up (n=56)

Variables	CG Individual – EG Individual			CG Collaborative – EG Collaborative			CG Individual – CG Collaborative			EG Individual – EG Collaborative			R ² for the total model
	Mean difference	CI	p-value ^a	Mean difference	CI	p-value ^a	Mean difference	CI	p-value ^a	Mean difference	CI	p-value ^a	R ²
Salt consumption													
Discretionary salt	3.03	1.82-4.24	<0.001	4.12	2.88-5.36	<0.001	-1.10	-2.34-0.13	0.078	-0.01	-1.24-1.21	0.980	0.69
Na-FFQ	2.48	0.99-3.47	0.001	2.00	0.40-3.60	0.015	0.88	-0.71-2.48	0.271	0.41	-1.11-1.93	0.592	0.67
24-hour recall	0.49	-0.28-1.26	0.211	1.24	0.44-2.03	0.002	-0.70	-1.48-0.08	0.077	0.05	-0.73-0.83	0.899	0.26
Total salt	6.73	4.19-9.29	<0.001	7.53	4.84-10.22	<0.001	-0.98	-3.69-1.73	0.470	-0.18	-2.77-2.41	0.889	0.70
Psychosocial variables													
Habit	2.59	2.11-3.06	<0.001	3.06	2.60-3.53	<0.001	-0.15	-0.61-0.30	0.505	0.32	-0.17-0.81	0.191	0.87
Intention	-0.70	-1.04 to -0.36	<0.001	-1.05	-1.4 to -0.70	<0.001	0.38	0.04-0.72	0.027	0.03	-0.31-0.36	0.875	0.68
Self-efficacy	-1.41	-1.90 to -0.91	<0.001	-1.86	-2.3 to -1.35	<0.001	0.55	0.08-1.02	0.023	0.09	-0.38-0.57	0.696	0.78

Note. ^ap-values were obtained by linear regression models, which included the total salt intake and its comparison between groups. CI: Confidence interval; Na-FFQ: Sodium Frequency Food Questionnaire.

DISCUSSION

The results obtained in the study suggest that there is a potential effect in reducing salt intake through the Implementation Intention strategy.

Despite the small sample size, this study makes two interesting contributions to the field of primary-care nursing in Brazil and, more specifically, to the follow-up of HF patients in this setting: (1) The use of a theory-based nursing intervention, described in detail, that could be integrated as part of the routine of nursing consultation due to its low cost and easy implementation; (2) Two different ways of intervention delivery (individual and collaborative) to reduce salt intake, that allow patients who do not prepare their own food to also benefit from the intervention.

Regarding the Implementation Intention to improve healthy behaviours, recent meta-regression indicated that the development of simple 'if-then' and action plans are more effective in changing dietary behaviours than complex plans or complex intervention designs (Carrero et al., 2019). The reduction in salt intake observed in our study might be explained by the development of plans based on patient daily routines, preferences, and possibilities of buying food.

In the Brazilian culture, women are usually responsible for meal preparation at home. Thus, including men in this study and adopting the collaborative approach to intervention were important as a strategy. Moreover, our data indicate that a collaborative approach appears promising in reducing salt intake, which is a complex nutritional behaviour. In fact, studies have shown that collaborative interventions involving a social referent could be more effective in enhancing physical-activity behaviour (Prestwich et al., 2012), improving oral care among healthy children and their parents (Davies et al., 2017) and among children and adults with a repaired cleft lip and/or palate (Armitage et al., 2019). Regarding to nutritional behaviours, collaborative approaches aiming at improving fruits and vegetable intake among teenagers (Lavado, 2009) and among children (Thompson et al., 2015) in collaboration with their parents are reported.

Our study adds to those observations, showing that the Implementation Intention carried out collaboratively was as efficient as the individual approach. Contrasting with these studies that included children and adults (Armitage et al., 2019; Davies et al., 2017; Thompson et al., 2015), our study involved only adults. Even so, both forms of intervention have shown to be potentially efficient in reducing dietary salt intake among HF patients including the action of adding salt during meal preparation by the social referent.

Since we enrolled patients with low levels of education and income, we produced two identical copies of the plan (one for the patient and one for the investigator), to reinforce or adapt the plan to risk situations that were not specified in the first nursing meeting. Even people with little scholar education were capable to think about their daily routine and propose action and coping plans to change their salt intake. The fact that the patients and social referents were free to build their action and coping plans made it possible to consider their preferences, daily routines, and ability to buy food according to their income, which might have improved the effect of the intervention.

The psychosocial variables were assessed to gain an understanding of how the intervention worked in terms of psychological process that generated the change in behaviour. In that regard, the results suggest that intention and self-efficacy increased significantly in both experimental groups, whereas they remained stable in the control groups. Changes in intention were not expected in these post-volitional interventions, but we must consider that the two telephone calls and the personal reinforcements at T₂ may have operated as motivational strategies, contributing to the increase in the measurements of intention at the end of the follow-up (Bieleke et al., 2018). Nevertheless, increases in self-efficacy score were expected. In fact, post-volitional interventions are recognized as strengthening the perception of self-efficacy. Thus, individuals have a better perception of behaviour control and became more aware of their abilities to achieve the goal (Wieber et al., 2015). Lastly, the significant reduction in the habit score in the experimental groups suggests that the intervention helped to reduce the automatic behaviour related to salt intake.

LIMITATIONS

One of the study's limitations is the difficulty in recruiting participants (mainly because of specific aspects of the clinical setting), which led to the small sample size. Indeed, since a public primary-care clinic was involved, there was significant difficulty in the accessing echocardiogram exams as well as assessing other facilities that could optimize the identification and registration of new HF cases.

Given the recruitment issues, we have calculated a sample size for future work considering our results and the means of a medium-degree effect size measurement (Cohen, 1992), based on the assumption of a significance level of 5%, a test power of 80% and an effect size of 0.25. Considering the values obtained through the sample size for an ANOVA model of repeated measures, we recommend a minimum of 136 participants for future research. An attrition rate of about 20-30% must be considered in calculating the sample size in further studies.

Another limitation of this study concerns the NYHA functional class of the participants, most of them were in initial stages of HF (FC I). The results might not be the same at more advanced stages of HF. Another limitation is the lack of information about the length of the HF patient's follow-up in the health clinic before enrollment. In addition to the small sample size, whether the patient was exposed to various levels of education about healthy salt intake as part of the usual care is uncertain.

In future studies, it would be interesting to test mediator and moderator effects of the psychosocial variables, which was not possible given the small sample size in our study. Another limitation was the short follow-up period. Longer intervals would be important to assess the intervention effect on maintaining behavioural change.

Despite the limitations, we showed the potential efficacy of Implementation Intention in reducing salt intake among HF patients, even for those who are not responsible for preparing their meals at home. Despite the lack of comparison between the patients who followed the developed plans and those who did not, the results of this

study can be used to plan further studies involving larger samples due to the randomized trial design adopted. We also tested the effect on several variables (behavioural and psychosocial), which can be useful outcomes in future interventions. The intervention report based on TIDieR (Hoffmann et al., 2014) must be highlighted, since we described it in as many details as possible.

This study also provided useful information for studies conducted in clinical settings. For instance, it brought out additional challenges for nurses in primary-care clinical practice. In the Brazilian context, it could be important to improve the access to diagnostic exams, as well as upgrade the system of records for faster identification of HF patients. Lastly, our results point to the relevance of using well-planned theory-based interventions in nursing appointments to better target and solve important clinical problems.

CONCLUSION

This study showed the potential efficacy of Implementation Intention strategy in reducing salt intake among HF patients when applied individually and collaboratively. The intervention results suggest that a positive effect on intention, self-efficacy and habit might have contributed to a reduction in salt intake. The study offers results to justify the implementation of a larger randomized clinical trial among HF patients to reduce salt intake.

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