Journal of Marital and Family Therapy
doi: 10.1111/jmft.12281

FAMILY AND COUPLE VARIABLES REGARDING ADHERENCE IN TYPE 2 DIABETES PATIENTS IN THE INITIAL STAGES OF THE DISEASE

M. Graça Pereira, Susana Pedras, Gabriela Ferreira, and José C. Machado
University of Minho, School of Psychology

This study analyzed which family and couple variables predicted adherence to standard care treatment, in patients recently diagnosed with type 2 diabetes. The sample comprised 224 dyads assessed during the first year of diagnosis (T1) and 4 months later (T2). The results showed that family stress, dyadic adjustment, family coping, and positive support assessed by patients at T1 predicted medication adherence and glucose monitoring at T2. Positive support and dyadic adjustment, assessed by partners at T1, predicted patients' adherence to glucose monitoring and diet at T2. This study highlights the important role of the partner in patient's adherence. Therefore, standard care in type 2 diabetes should be offered in the context of the dyad.

Type 2 diabetes mellitus (T2DM) is the most common type of diabetes and results from the insufficient production of insulin by the pancreas or the ineffective use of the produced insulin. T2DM is intimately associated with excessive body weight and physical inactivity (World Health Organization [WHO], 2016). Nowadays, diabetes is a public health problem, reaching about 422 million people worldwide, in 2014, and being a major cause of morbidity and mortality (Valdez, 2009; WHO, 2016). According to WHO (2016), diabetes is the main cause of blindness, amputation, and kidney failure and, in 2030, it will be the seventh principal cause of death. In Portugal, a recent study revealed that 13.3% of the population have diabetes, 27.4% prediabetes and the estimated cost associated with diabetes is around 12% of the health expenditure (Portuguese Society of Diabetes [PSD], 2016).

Managing T2DM and promoting adherence to self-care behaviors, is crucial because nonadherence results in serious complications in long-term (American Diabetes Association [ADA], 2016; WHO, 2016) and decreases patients' quality of life (Saleh, Mumu, Ara, Hafez, & Ali, 2014). T2DM treatment has several demands requiring patients to plan and integrate self-care behaviors in their daily routine, such as a healthy diet, practice moderate physical activity, take medication, foot care, and monitor blood glucose (Delamater, 2006; Toobert, Hampson, & Glasgow, 2000). However, the literature has revealed that nonadherence is very common among patients with T2DM (DeBerardis et al., 2005; Ganiyu, Mabuza, Malete, Govender, & Ogunbanjo, 2013; Mahfouz & Awadalla, 2011; World Health Organization [WHO], 2003). Indeed, Gatt and Sammut (2008) suggested that patients seem to perform more the self-care behaviors that require less effort and changes in lifestyle, such as taking medication, when compared to physical activity and diet. Therefore, it becomes pertinent to study the factors that may interfere with patients' adherence to T2DM treatment.

M. Graça Pereira, PhD, is an Associate Professor with Aggregation at School of Psychology, University of Minho, Braga, Portugal; Susana Pedras PhD, is a Researcher at School of Psychology, University of Minho, Braga, Portugal; Gabriela Ferreira, MS, is a Research Assistant at School of Psychology, University of Minho, Braga, Portugal; José C. Machado, PhD, is an Assistant Professor at Institute of Social Sciences, at University of Minho.

The authors report no conflicts of interest in this work.

This study is part of a research project PTDC/SAU-ESA/67581/2006 supported by the Foundation for Science and Technology of Portugal (FCT).

Address correspondence to M. Graça Pereira, School of Psychology, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal; E-mail: gracep@psi.uminho.pt

The Individual and Family Self-Management Theory (IFSMT; Ryan & Sawin, 2009) provides a theoretical framework that allows to understand which factors influence adherence, suggesting that self-care is grounded on three dimensions: the context, the process and the outcomes. The context includes patients and families' involvement in the process of self-care and, consequently, contributes to patients' outcomes. The contextual factors include the specific condition of the disease, the physical and social environment, as well as the individual and family factors. The process dimension includes knowledge about the illness and beliefs, self-regulation skills, and social facilitation. Finally, the outcomes may be proximal, which include the involvement of the individual and the family on self-care; and distal including health status, quality of life, and health costs. Based in the IFSMT (Ryan & Sawin, 2009), the present study focused on contextual factors such as family and couple variables – family stress, family coping, dyadic adjustment, and partner support – in order to analyze how these variables predict positive proximal outcomes such as adherence to self-care behaviors.

Family Stress

A diagnosis of T2DM is itself a stressful situation, which requires the family to search adaptive ways to cope (Bhandary, Rao, & Sanal, 2013; Fisher et al., 1998). In this sense, family stress has been associated with T2DM and considered an important factor in adherence to treatment. In fact, stress plays a major role in T2DM, leading directly to the increase of blood glucose and, thus, to poor glycemic control (Amaral, 2012; Bhandary et al., 2013; Gonzalez et al., 2008; Guthrie, Bartsocas, Jarosz-Chabot, & Konstantinova, 2003; Polonsky et al., 2005). Indirectly, stress interferes with adherence to self-care behaviors, leading patients to ignore health care practices and adopt unhealthy behaviors that interfere with diet, exercise, and medication (Lloyd, Smith, & Weinger, 2005; Powers, 2005). A study that analyzed the efficacy of a stress management program on metabolic control (Surwit, 2002) found that patients with T2DM, who participated in the program, showed a significant decrease of 0.5% in glycated hemoglobin (HbA1c). However, it has been suggested that stress might be also positive and promote adaptation to T2DM (Bennett, Guo, & Dharmage, 2007), encouraging the involvement in self-care behaviors (Lane et al., 2000).

Family Coping

Family coping is a process that promotes the family's organization and the individual growth when dealing with stress (Price, Price, & McKenry, 2010). A qualitative study identified the coping strategies that patients and their families use to deal with the stress related to T2DM. In their study, DeCoster and Cummings (2004) proposed the classification of coping strategies into two categories: "healthy strategies" that include learning about T2DM, choosing healthy food, and developing an exercise program; and "unhealthy strategies" include denying the severity of T2DM, rationalizing, and using humor in an inappropriate way. Family coping plays an important role in adherence to T2DM treatment and has been associated with metabolic control (Gafvels & Wandell, 2006). A study conducted with patients with T2DM found that male patients who live with the spouse showed better coping skills to deal with stress and female patients showed a lower psychological impact of T2DM and less stress related to the disease (Hara et al., 2014).

Family functioning is essential for T2DM management (Bhandary et al., 2013; Fisher et al., 2000). Families who cope better with T2DM show a better organization, well-defined roles, control beliefs toward life and skills to deal with different opinions related to T2DM treatment. In turn, patients whose families are characterized by higher levels of conflict showed poor adherence to T2DM treatment (Fisher et al., 2000). The same was true for families with rigid control over patients that has been associated with lower medication adherence (Garay-Sevilla et al., 1995). Therefore, family coping is considered an important variable in diabetes and an association between poor adherence to treatment and families' difficulties regarding adaptation to T2DM has been reported in the literature (DeCoster & Cummings, 2004; Fisher et al., 2000; Gafvels & Wandell, 2006; Garay-Sevilla et al., 1995).

Marital Adjustment

Marital or dyadic adjustment includes the level of satisfaction, cohesion, consensus, and expression of affection (Hernandez, 2008). Studies have shown that T2DM patients living with a partner reported low dyadic adjustment, and more difficulties in managing the disease (Dempster, McCarthy, & Davies, 2011; Trief, Himes, Orendorf, & Weinstock, 2001; Trief, Ploutz-Snyder, Britton, & Weinstock, 2004), because diabetes management involves high levels of cooperative behavior (Chesla et al., 2004; Fisher, 2006). Another study conducted with T2DM male patients showed an association between poor adherence to self-monitoring of blood glucose and marital conflict, as well as wives' criticism (Merrill, 2008). In fact, several studies have suggested that patients who presented better marital adjustment showed better adherence to diet, physical activity, and medical recommendations (Berg & Upchurch, 2007; Fisher et al., 2004; Fung, 2009; Miller & Brown, 2005; Trief et al., 2004). An association between the quality of interactions of partners and patients, and the participation of partners in patients' chronic illness management, has been reported (August, Franks, Rook, & Stephens, 2013).

Partner Support

Several studies have found an association between patients' nonadherence and lack of partner support (Bhandary et al., 2013; Mosnier-Pudar et al., 2009; Schiøtz, Bøgelund, Almdal, Jensen, & Willaing, 2012; Tiv et al., 2012). Given the fact that T2DM often requires the involvement of the partner in the treatment (e.g., helping to buy, plan and prepare the meals; remembering to take medication; doing exercise together) (Mosnier-Pudar et al., 2009; Stephens, Rook, Franks, Khan, & Iida, 2010), partners' support is crucial for patients' adaptation to T2DM (Beverly, Wray, & Miller, 2008; Costa, Pereira, & Pedras, 2011; Miller & Brown, 2005; Park, Tudiver, Schultz, & Campbell, 2004; Pereira, Pedras, & Machado, 2014), as well as for well-being (Schiøtz et al., 2012) and marital adjustment (Neff & Karney, 2005). Studies suggested that there are two types of partner support: positive support includes encouragement, praise, and reminding to take medication, being associated with better adherence to diet, medication, physical activity, and self-monitoring of blood glucose; and the negative support includes criticizing and nagging, and is associated with poor adherence (Mayberry & Osborn, 2012; Stephens et al., 2010; Trief et al., 2003, 2011). It appears that both negative and positive partner support is influential in treatment adherence (Costa et al., 2011; Pereira et al., 2014).

Current Study

Although the importance of family and couple variables regarding adherence has been acknowledged and studied in patients with T2DM (Pereira et al., 2014; Pedras, Pereira, & Ferreira, 2012), the present study focused on recently diagnosed patients, regarding how contextual variables assessed by patients (partner support, dyadic adjustment, family stress and family coping) and partners (partner support and dyadic adjustment) at baseline, predicted the proximal outcome of adherence to self-care behaviors 4 months later (patient's next routine assessment), considering the IFSMT theoretical framework (Ryan & Sawin, 2009) and taking into consideration the duration of diagnosis. For patients, it is expected that higher levels of positive partner support, dyadic adjustment, and family coping, as well as lower levels of negative partner support and family stress, at baseline, will predict better adherence to T2DM self-care behaviors 4 months later. For partners, it is expected that higher levels of positive partner support and dyadic adjustment, as well as lower levels of negative partner support, at baseline, will predict patient's adherence, 4 months later.

The Portuguese population follows a Mediterranean diet and, according to the Regional Health Profile, the age pyramid of the Northern Health Region shows a strong increase in elders with a low level of education and health literacy (Neto, Pimentel, Tavares, Araújo, & Guerreiro, 2015). Therefore, from a heuristic point of view, it is important to understand, as early as possible, how patients adjust to the initial stages of the disease, and which patients' and partners' variables predict adherence to self-care behaviors so that intervention programs address patients' needs with such demographic characteristics, promoting adherence to treatment, and preventing T2DM complications. Also, this study may add to the importance of collaborative care in T2DM treatment, that is, the need of a biopsychosocial approach that acknowledges the importance of both

individual and family (e.g., partner) physical and mental health regarding therapeutic adherence in a complex treatment regimen disease (Katon et al., 2012).

METHOD

Participants

The sample included 224 dyads of Caucasian patients with T2DM and their respective partners. All of the couple dyads were heterosexual. Patients were taking only oral medication for diabetes and were diagnosed in the past 12 months. Approximately 55% of the patients were male, mean age for the sample was 59.7 years (SD = 9.9). Regarding patient education, 69.2% had only 4 years of education (fourth grade), 13.4% had 6 years, 8.9% had 9 years, 3.1% had more than 9 years, and 4.9% had no education. The entire sample was married/living together and the mean duration of the marriage was 32.9 years (SD = 12.3). Fifty-six percent were diagnosed during the 5 months prior to the assessment and 44% between 6 and 12 months. For partners, mean age was 59.5 years (SD = 9.9). Regarding partners' education, 64.4% had 4 years of education (fourth grade), 15.8% had 6 years, 8.4% had 9 years, 5.0% had more than 9 years, and 6.4% had no education.

Procedure

The Ethics Committee of North Regional Health Association, in Portugal, approved the present study. In 2010, there were 130 health care centers in the North of Portugal, employing 887 physicians, 904 nurses, and 705 administrative assistants (Miguel & Sá, 2010). The data were collected in 40 health care centers in the North of Portugal. The Regional Health Profile reported that the Northern Health Region is the most populous in Portugal, covering a resident population of 3.614,882 inhabitants, representing about 35% of the population of the country (Neto et al., 2015).

Health professionals identified the newly diagnosed patients and the family physician invited the patients, who fulfilled the inclusion criteria, to participate in the study. The inclusion criteria were: being diagnosed with T2DM no longer than a year prior to the assessment, taking only oral medications for T2DM, having a partner, and be 18 years of age or older. Patients were later contacted by one of the researchers by telephone to set a time to answer the questionnaires. All invited patients agreed to collaborate in the study and there were no refusals. All participants were informed about the purpose of the study and signed an informed consent. Participation was voluntary and took place the day of the patient's routine assessment.

Data were collected between 2010 and 2013. Patients and partners answered the questionnaires individually in a room provided by the health care unit for that purpose, in the presence of one of the researchers. Patients' and partners' questionnaires took approximately 30 and 15 min, respectively. The partners were asked to complete only two questionnaires that assessed dyadic adjustment and partner support. Family coping and family stress questionnaires were not included due to their great number of items, in order to increase partner's participation in the study, since they had to come with the patient for that purpose, only. Health professionals completed the information regarding patients' clinical data.

The study used a longitudinal design with two assessment moments: T1 (baseline—during the first year of diagnosis) and 4 months after the first assessment (T2). In Portugal, primary care patients receive education regarding T2DM in their nursing routine appointments approximately every 4 months. Therefore, the second assessment (T2) was the patients' next routine appointment.

Measures

Completed by patients. Revised Summary of Diabetes Self-care Activities Measure (RSDSCA; Toobert et al., 2000)—This measure assesses levels of self-care and management of the different components of the Diabetes regimen. It is composed of 11 items related to diet (e.g., "In the past 7 days, on how many days did you eat five or more portions of fruit and vegetables?"), physical activity (e.g., "In the past 7 days, on how many days did you participate at least in 30 min of physical activity?"), monitoring of blood glucose (e.g., "In the last 7 days, on how many days have you

measured your sugar level in the blood?"), foot care (e.g., "For the past 7 days, on how many days have you checked your feet?"), and smoking (e.g., "Have you smoked a cigarette in the last 7 days?"). The scores range between 0 and 28 for diet, and 0 and 14 for physical activity, foot care, and monitoring of blood glucose. Total scores range between 0 and 70 and higher scores indicate better adherence to self-care behaviors. The revised scale was used in a study conducted by Thoolen, De Ridder, Bensing, Gorter, and Rutten (2006), and the alpha found was .63. In this study, the *alpha* for the diet subscale was .60, for physical activity subscale was .76, for glucose monitoring subscale was .93, and for foot care subscale was .72.

Medication Adherence Report Scale (MARS; Horne, 2001)—This scale measures medication adherence, consisting of five items (e.g., "I forget to take the medicines"; "I take less quantity than prescribed"). Scores range between 5 and 25, with a higher score indicating better medication adherence. The original Cronbach *alpha* was .70 (Horne, 2001; Farmer, Kinmonth, & Sutton, 2005), while in this sample, was .74.

Family Crisis-oriented Personal Evaluation Scale (F-COPES; McCubbin, Olson, & Larsen, 1987)—This scale assesses family coping and comprises 29 items arranged in five subscales: seeking social support (e.g., "In our family, when we deal with problems, we respond by sharing our difficulties with family members"); reframing (e.g., "In our family, when we deal with problems, we respond by facing the problems ahead and trying to find solutions immediately"); seeking spiritual support (e.g., "In our family, when we deal with problems, we respond going to mass in the church or other religious service"); mobilizing family to acquire and accept help (e.g., "In our family, when we deal with problems, we respond receiving offers and help from our neighbors (food, mail, etc.)"); and the passive appraisal (e.g., "In our family, when we deal with problems, we respond watching TV"). The answers are given in a 5-point *Likert* scale, ranging between one (strongly disagree) and five (strongly agree). In this study, only the total scale was used. Higher scores indicate better coping. In a study conducted by Olson et al. (1989), an alpha of .86 was found. Cronbach *alpha* for this sample was .75.

Family Inventory of Life Events (FILE; McCubbin, Patterson, & Wilson, 1981)—This instrument evaluates family stress and strains. It is composed of 71 items and nine subscales: intra-family strains (e.g., "Increased discussions between parents and children."); marital strains (e.g., "Spouse/partner separated or divorced."); pregnancy and childbearing strains (e.g., "The wife had an unwanted pregnancy or a difficult pregnancy."); finance and business strains (e.g., "He/She was at the unemployment fund."); work-family transitions and strains (e.g., "One member of the family retired."); illness and family "care" strains (e.g., "One family member was physically disabled or seriously ill."); losses (e.g., "Death of in-laws or other close relatives."); transitions "in and out" (e.g., "One family member got married."); and family legal violations (e.g., "A family member was arrested or detained by the police."). The items are dichotomous and coded "yes" if the event/change occurred in the last 12 months. The maximum score is 71. In this study only the global score was used, where higher scores indicate higher family stress. In the original version, an alpha of .81 was found for the total scale (McCubbin et al., 1981). The Cronbach *alpha* for this sample was .84.

Completed by patients and partners. Revised Dyadic Adjustment Scale (RDAS; Busby, Christensen, Crabe, & Larson, 1995)—RDAS is a 14-item scale that evaluates Dyadic Adjustment, organized in three subscales: dyadic consensus (e.g., "How much do you and your partner agree on important decision-making?"), dyadic satisfaction (e.g., "How often do you get angry with your partner?") and dyadic cohesion (e.g., "How often do you and your partner discuss something quietly?"). The scores range between 14 and 83, and higher scores indicate better dyadic adjustment. In this study only the total scale was used. The Cronbach alpha for the original scale was .90, and in this sample was .85 for patients and .74 for partners.

Multidimensional Diabetes Questionnaire (MDQ; Talbot, Nouwen, Gingras, Gosselin, & Audet, 1997)—The original version comprises 41 items arranged in three sections, which assess cognitive and social factors related to diabetes. In the present study, only section II was used. This section consists of 12 items and evaluates the frequency of partner support behaviors related to the patients' performance of different self-care behaviors (medication, diet, self-monitoring glucose, physical activity, and foot care). Supportive behaviors are categorized into positive reinforcing behaviors (e.g., "My partner praises me when I follow my diet."; "My partner reminds me to take

the medication for diabetes.") and misguided support behaviors (e.g., "My partner presses me with my diabetes medication."; "My partner presses me with my physical activity."), so higher results indicate higher levels of positive or negative support, respectively. In the original version, alphas of .88 and .70 were found for positive and negative support, respectively. In this study, Cronbach alpha for positive support was .85 and .78 for negative support, in patients; and .85 for positive support and .81 for negative support, in partners.

Data Analysis

A multivariate linear regression model for patients and another for partners was designed for the adherence variables at Time 2 (dependent variables), and family variables at Time 1 (independent variables). Because negative and positive support were highly correlated and to avoid multicollinearity, in the regression models, only positive partner support was introduced. For both models, in the initial model, dependent variables for patients were: adherence to medication (MARS), adherence to diet, adherence to exercise, adherence to glucose monitoring and foot care (four subscales of RSDSCA). For the patients' model, the independent variables were positive partner support (MDQ), family stress (FILE), family coping (F-COPES), and dyadic adjustment (RDAS). For partners' model, the independent variables were positive partner support (MDQ) and dyadic adjustment (RDAS).

Model fit was assessed using model chi-square, goodness fit index (GFI), root mean square error approximate (RMSEA), and standardized root mean square residual (SRMR). Adequate fit was defined as chi-square p-value over .05, GFI over 0.95, RMSEA below 0.07 and SRMR below 0.08 (Hooper, Coughlan, & Mullen, 2008). Because patients receive nursing education regarding T2DM in their routine consultations, the analysis took into consideration two groups of patients: those diagnosed until 6 months that received 1–2 medical/nursing consultations and those diagnosed between 7 and 12 months that received 3–4 consultations. For both groups, T2 happened 4 months after the first assessment. Then, a multiple-group path analysis was used taking time since diagnosis into consideration. The following steps were conducted: first, unconstrained multiple-group model across time of diagnosis, in which the same pattern of structural paths was tested without constraints across groups; second, constrained multiple-group model, where structural paths were constrained to be equal across groups. The comparison between the two nested models was tested through the significance of the difference of the chi-square value.

The use of the square Mahalanobis distance and the confirmation of normality of the variables through the asymmetry coefficients and univariate and multivariate kurtosis, allowed the elimination of the cases that generated the violation of assumptions. In the final model, no variable showed values of asymmetry and kurtosis indicators of violation of the normal distribution; there were no Mahalanobis distance indicators of the existence of outliers; and there were no strong correlations between the exogenous variables, indicators of multicollinearity. Standardized beta coefficients (β) were derived for each explanatory variable in order to allow the comparison and estimation of the relative importance of each measure. To calculate the 95% confidence interval (CI), a 2000 bootstrap resample was used. In order to calculate difference between the two moments, the general linear model repeated measures was performed with gender as a factor, on all dependent variables assessing therapeutic adherence.

All standard statistical analyses were done using the IBM SPSS Statistics 22. Path analyses were done in IBM SPSS Amos 22.

RESULTS

Gender Differences

The results showed that there were no gender differences on adherence to medication (F (1, 222) = 0.65, p = .42), diet (F (1, 222) = 0.15, p = .70), physical activity (F (1, 222) = 2.66, p = .10), self-monitoring of blood glucose (F (1, 222) = 0.006, p = .94), and foot care (F (1, 222) = 0.14, p = .71).

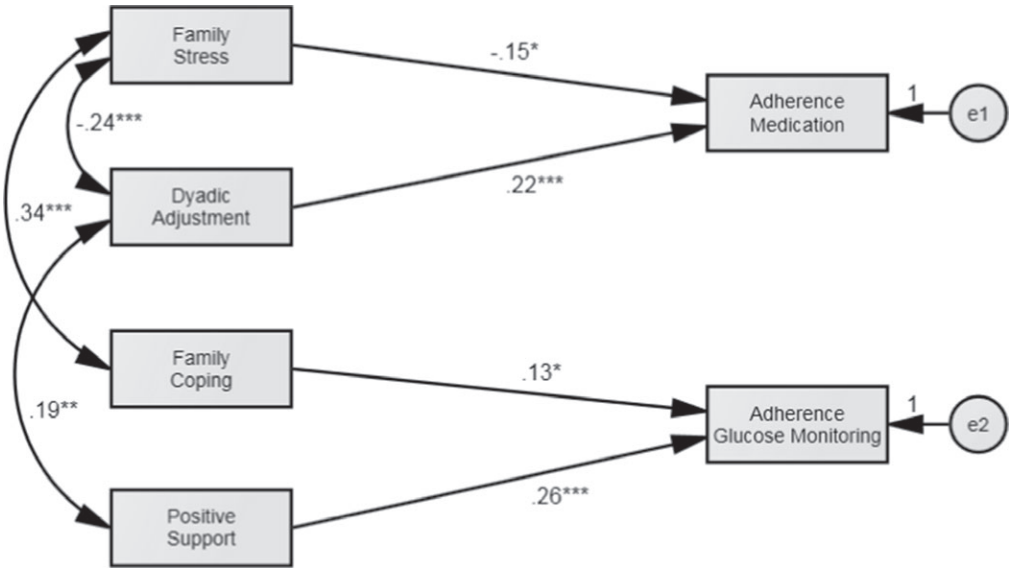
Predictors of Adherence at T2: Patient's Model

The multivariate linear regression model in patients between family variables and adherence showed a good global adjustment: $\chi^2_{(17)} = 23.83$, $p = .124$; RMSEA = 0.043 (90% CI = 0.000, 0.081); GFI = 0.974 SRMR = 0.047. The regression coefficients between family stress ($\beta = -.15$, $p = .026$, 95% CI = −0.292, −0.021) and dyadic adjustment ($\beta = .22$, $p < .001$, 95% CI = 0.085, 0.345) and medication adherence were statistically significant, which means that lower levels of family stress and higher levels of dyadic adjustment from patients' assessment at T1 predicted higher levels of patients' adherence to medication at T2. Also in this model, the regression coefficients between family coping ($\beta = .13$, $p = .038$, 95% CI = 0.005, 0.250) and positive support ($\beta = .26$, $p < .001$, 95% CI = 0.114, 0.411) and between family coping and adherence to glucose monitoring were statistically significant, meaning that better family coping and higher levels of positive support from patients' assessment, at T1, predicted higher levels of patients' adherence to glucose monitoring at T2. No patients' variables predicted adherence to foot care or exercise (Figure 1).

In the multiple-group path analysis, in the patient's model, the chi-square difference between the unconstrained and full constrained model was not significant, $\Delta\chi^2_{(8)} = 8.00$, $p = .434$, suggesting that all structural paths were equal across time since diagnosis. So, in the patient's model, time since diagnosis did not have an impact on the results (Table 1).

Predictors of Adherence at T2: Partner's Model

The multivariate linear regression model for patients between adherence variables and family variables showed a good global adjustment: $\chi^2_{(5)} = 12.04$, $p = .034$; RMSEA = 0.076; (90% CI = 0.019, 0.132); GFI = 0.981; SRMR = 0.048. The regression coefficients between positive support and glucose monitoring adherence ($\beta = .21$, $p < .001$, 95% CI = 0.084, 0.347) were statistically significant, which means that higher levels of positive support from partners' assessment, at T1, predicted higher levels of patients' adherence to glucose monitoring at T2. Also in this model, the regression coefficients between dyadic adjustment and adherence to diet ($\beta = .14$, $p = .028$, 95% CI = 0.010, 0.255) were statistically significant, which means that higher levels of dyadic adjustment from partners' assessment, at T1, predicted higher levels of patients' adherence to diet at T2. No partner's variables predicted adherence to foot care or exercise (Figure 2).

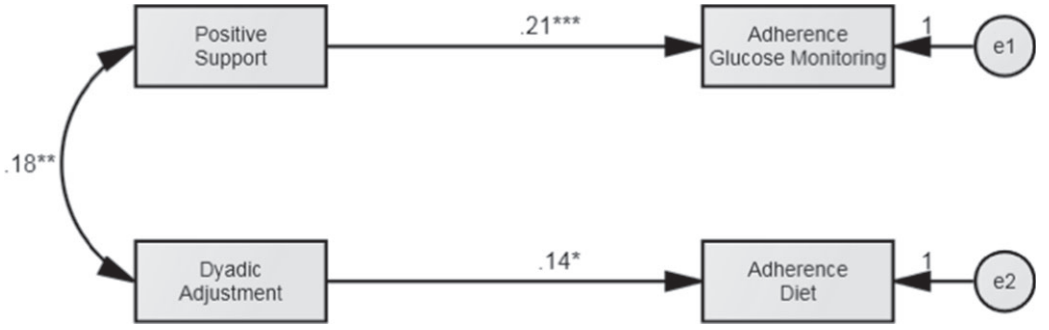


*** p < .001; ** p < .01; * p < .05

Figure 1. Multivariate linear regression for patients (with standardized estimates).

Table 1
Model fit in multiple-group path analysis for Patients and Partners.

	χ^2 ($\Delta\chi^2$)	*df* (Δdf)	*p* (Δp)	χ^2/df	RMSEA	P[RMSEA ≤ 0.05]	SRMR	GFI
Patients Model								
M1- Unconstrained	46.553	34	.074	1.369	0.041	0.668	0.0609	0.951
M2- Structural weights	54.549	42	.093	1.299	0.037	0.771	0.0685	0.941
M2 versus M1	7.996	8	.434					
Partners Model								
M1- Unconstrained	17.827	10	.058	1.783	0.057	0.351	0.0662	0.973
M2-Structural weights	19.813	14	.136	1.415	0.041	0.597	0.0685	0.969
M2 versus M1	1.986	4	.738					



*** p < .001; ** p < .01; * p < .05

Figure 2. Multivariate linear regression for partners (with standardized estimates).

In the multiple-group path analysis, for partner's model, the chi-square difference between the unconstrained and full constrained model was not significant, $\Delta\chi^2_{(4)} = 1.99$, $p = .738$, suggesting that all structural paths were equal across time since diagnosis. So, in the partner's model, time since diagnosis did not have an impact on the results (Table 1).

DISCUSSION

This study aimed to analyze which family and couple variables from the patients' perspective (partner support, dyadic adjustment, family stress and coping) and from partners' perspective (partner support and dyadic adjustment) at T1 predicted patients' adherence (diet, glucose monitoring, physical activity, foot care, medication) at T2 in the initial stages of the disease.

In general, results corroborated the IFSMT (Ryan & Sawin, 2009) showing that contextual variables—dyadic adjustment, positive support, family stress, and coping—at baseline predicted the proximal outcome of adherence to self-care behaviors 4 months later, thus contributing to the understanding of self and family management of T2DM.

Taking into consideration the patients' model, results showed that lower levels of family stress and higher levels of dyadic adjustment, from patients' assessment at T1 predicted higher levels of medication adherence at T2. Indeed, family stress is considered an important factor regarding patient's adherence to T2DM treatment (Bhandary et al., 2013; Fisher et al., 1998) contributing to the increase of blood glucose as well as interfering with adherence to self-care behaviors, like ignoring health care practices and adopting unhealthy behaviors, with consequences on diet, exercise, and medication (Lloyd et al., 2005; Powers, 2005). Besides, Trief et al. (2006) found an association between greater marital stress and poorer blood glucose control. Regarding dyadic adjustment, several studies have found an association between marital adjustment and better adherence to diet, physical activity, and medical recommendations (Berg & Upchurch, 2007; Fisher et al., 2004; Fung, 2009; Miller & Brown, 2005; Trief et al., 2004). In fact, it seems plausible to assume that, if patients reported less family stress and higher dyadic adjustment, after T2DM diagnosis, in the initial stages of the disease, (Berg & Upchurch, 2007; Bhandary et al., 2013; Dempster et al., 2011; Fisher et al., 1998, 2004; Fung, 2009; Miller & Brown, 2005; Trief et al., 2001, 2006, 2004, 2003, 2011; Trief, Wade, Britton, & Weinstock, 2002) later on, they will present better adherence to self-care behaviors, particularly adherence to medication.

Higher levels of family coping from patients' assessment, at T1, predicted higher levels of adherence to glucose monitoring at T2. Actually, some studies illustrate the importance of family coping on adherence to T2DM treatment and showed an association between coping and metabolic control (Gafvels & Wandell, 2006). Hara et al. (2014) found that male patients with T2DM living with their spouses exhibited better coping skills to deal with the stress from the disease compared to females.

Moreover, higher levels of partner positive support (e.g., encouragement, remembrance, congratulations, planning) from the patients' perspective at T1 predicted higher levels of adherence to glucose monitoring at T2. Interestingly, also higher levels of positive support from partners' perspective, at T1, predicted higher levels of patients' adherence to glucose monitoring at T2. Therefore, in the initial stages of the disease, not only patients' perception of positive support, after diagnosis, contributed to better adherence to glucose monitoring later, but also partners' perception of the positive support played a role in treatment adherence. Indeed, the literature suggested that partners support is crucial to patients' adaptation to T2DM (Beverly et al., 2008; Miller & Brown, 2005; Park et al., 2004) and to treatment adherence, because the latter involves high levels of cooperative behaviors (Fisher et al., 1998; Mosnier-Pudar et al., 2009; Ruddy & McDaniel, 2002). Positive partner support, in particular, has been associated with better adherence to diet, medication, physical activity, and self-monitoring of blood glucose (Fisher, 2006; Mayberry & Osborn, 2012; Pedras et al., 2012; Stephens et al., 2010; Trief et al., 2003, 2011), which is congruent with our results.

Family coping and partners' positive support, after diagnosis, revealed to be important for glucose monitoring possibly because, in spite of being considered an unpleasant task for some patients, requiring changes in daily routine, glucose monitoring is necessary for disease control (ADA, 2016). So, if a family has better skills to cope with the required changes and if patients benefit from their partners' help and feel supported by them; the stress related to glucose monitoring (Pedras et al., 2012) may decrease, contributing to better adherence at T2.

Finally, in the partners' model, higher levels of dyadic adjustment from partners' assessment at T1 predicted higher levels of patients' adherence to diet, at T2. In fact, as mentioned earlier, literature has shown that better marital adjustment contributed to better adherence to diet and medical recommendations (Berg & Upchurch, 2007; Fisher et al., 2004; Fung, 2009; Miller & Brown, 2005; Trief et al., 2004). It has also been suggested that the quality of interactions between patients and partners is associated with the involvement of partners in T2DM patient's treatment regimen (August et al., 2013). Indeed, adherence to the diet is one of the self-care behaviors in which healthy partners cooperate, because they often are involved in helping to buy, plan, and prepare healthy meals (Mosnier-Pudar et al., 2009; Stephens et al., 2010).

Adherence to foot care and exercise were not significantly predicted by patients or partners variables. These results may have to do with the fact that patients and partners may see these two health care behaviors, not a priority, right after the T2DM diagnosis, in the initial stages of the disease. Future longitudinal studies may pursue this hypothesis. Notwithstanding, the results emphasize the contribution of family variables, particularly better management of family stress and partner positive support from the patient and partner's perspective on dyadic adjustment regarding adherence to medication, glucose monitoring, and diet.

Finally, the IFSMT (Ryan & Sawin, 2009) was adequate and may even be useful in guiding clinical practice. In fact, the IFSMT was helpful in understanding how complex health regimens are influenced by individual and family factors that directly impact positive outcomes, as therapeutic adherence.

Implications for Clinical Practice

This study emphasizes the importance of family and couple variables regarding adherence to self-care behaviors and medication in recently diagnosed patients receiving treatment in primary care. The results have practical implications for health professionals, helping early on, to tailor interventions to the patient's needs in order to promote adherence and foster a better quality of life. According to the results, standard care provided to patients with T2DM, and interventions to promote adherence, should include partners, because they play an important role in patients' adherence to medication, diet, and self-monitoring of glucose. Primary health care delivery in T2DM should therefore be offered in the context of the dyad, that is, partners should be involved in patients' routine appointments and education regarding diabetes. Health professionals should also be aware of the importance of familiar process such as family stress and family coping, regarding adherence to T2DM. In nonadherence situations, multidisciplinary interventions that include a family therapist may be needed. In this situation, the medical family therapist needs to collaborate with the patient and family and

be focused on helping the partner to provide support for diabetes management in order to improve patients' motivation and behavior skills, as well as assessing the couple's psychosocial strengths or challenges related to diabetes management. Medical family therapists dealing with T2DM need also to collaborate with other health professionals in a way that enhances patient's care. Integrated behavioral care where medical family therapists collaborate with other health and psychosocial providers requires a coordinated treatment plan where the patient and family receive an integrated response to the biological and psychosocial processes involved in diabetes management (McDaniel, Doherty, & Hepworth, 2014) allowing also an easy access to family therapy services without burden and stigma. We believe that in primary care settings, particularly regarding chronic illness with complex regimens such as T2DM, standard care should be integrated care.

Taking into consideration the low level of education of the sample, health professionals may need to adequate the information regarding T2DM and its treatment to the patient's literacy level and also closely monitor diabetes self-care behaviors. For those patients not able to go to the health care center, having home care teams to help patients with behavioral change toward self-care behaviors and adherence to medication would be useful.

Strengths and Limitations

There are some limitations that need to be addressed. First, the sample was composed only by patients with T2DM and their respective partners, engaged in a heterosexual romantic relationship. This study only used self-report measures. Another limitation includes the fact that participants were Caucasian. The greatest strength of this particular study was the inclusion of patients from 40 health care centers of the north of the country that provides external validity to the findings since the majority of studies conducted in the primary health care context, are generally restricted to a single or few health care unit(s). In this sample, the mean age of education was 4 years, and the education level present in this sample, is common in Portuguese T2DM patients with the mean age of the present sample, and should be considered a limitation regarding the generalization of the results.

Future Research

Future research should include T2DM patients from the center and south regions of the country; patients with longer T2DM duration, in order to understand the impact of family variables on adherence to self-care behaviors and medication over time; and patients of other race and sexual orientation. Future research should also focus on assessing the impact of medical family therapy, on-site (when offered in primary care settings) versus off-site regarding therapeutic adherence, particularly medication adherence, in T2DM patients and families with low health literacy, as in this sample, that need psychoeducation about the diagnosis as well as motivational techniques for behavior change.

Since this study only included patients with partners, future studies should include single or living alone patients and, in these situations, include other sources of patients' support (e.g., peers, health professionals) as well as better educated patients and partners, controlling for health literacy.

Finally, future studies should consider longitudinal designs that assess patients and partners adherence for a long period of time, starting at diagnosis and qualitative studies to capture the experience of living with T2DM from both patients and partners' perspective regarding therapeutic adherence. Adopting objective measures of adherence such as electronic medical packaging (EMP) devices and pill count will also be useful to be included as dependent variables.

CONCLUSION

Family stress, dyadic adjustment, family coping, and positive support from partner, at T1, predicted medication adherence and glucose monitoring at T2. Positive support and dyadic adjustment assessed by partners, at T1, predicted patients' adherence to glucose monitoring and diet, at T2. This study adds to the importance of integrated behavioral health care in primary care settings showing how important medical and mental health practitioners may team up to help patients

attain their personal health goals. Close collaboration/integration will deliver a biopsychosocial model of care, ensuring that T2DM patients will be treated in a holistic manner. We believe that when chronic illnesses are concerned, there is a need for multidisciplinary teams that include health professionals, mental health providers, and social workers, particularly in situations when the patient's partnership is not a source of positive support or for those requiring the health care team to find other sources of patients' support, in order to promote better adaptation to diabetes and improved adherence.

REFERENCES

Amaral, A. (2012). Stresse, depressão e diabetes. [Stress, depression and diabetes]. *Revista Portuguesa de Diabetes*, *7*, 119–123. Retrieved from: http://spd.pt/images/rpd%20-%20setembro%202012.pdf

American Diabetes Association [ADA]. (2016). Standards of medical care in diabetes. *Diabetes Care*, *39*, S1–S112. Retrieved from: http://care.diabetesjournals.org/content/suppl/2015/12/21/39.Supplement_1.DC2/2016-Standards-of-Care.pdf

August, K. J., Franks, M. M., Rook, K. S., & Stephens, M. A. P. (2013). Spouses' involvement in their partners' diabetes management: Associations with spouse stress and perceived marital quality. *Journal of Family Psychology*, *27*, 712–721. https://doi.org/10.1037/a0034181.

Bennett, C. M., Guo, M., & Dharmage, S. C. (2007). HbA(1c) as a screening tool for detection of type 2 diabetes: A systematic review. *Diabetic Medicine*, *24*, 333–343. https://doi.org/10.1111/j.1464-5491.2007.02106.x.

Berg, C. A., & Upchurch, R. (2007). A developmental – contextual model of couples coping with chronic illness across the adult life span. *Psychological Bulletin*, *133*, 920–954. https://doi.org/10.1037/0033-2909.133.6.920.

Beverly, E. A., Wray, L. A., & Miller, C. K. (2008). Practice implications of what couples tell us about type 2 diabetes management. *Diabetes Spectrum*, *21*, 39–45. https://doi.org/10.2337/diaspect.21.1.39.

Bhandary, B., Rao, S., & Sanal, T. S. (2013). The effect of perceived stress and family functioning on people with type 2 diabetes mellitus. *Journal of Clinical and Diagnostic Research*, *7*, 2929–2931. https://doi.org/10.7860/JCDR/2013/7414.3689.

Busby, D. M., Christensen, C., Crabe, D. R., & Larson, J. H. (1995). A revision of the dyadic adjustment scale for use with distress and non distressed couples: Construct hierarchy and multidimensional scales. *Journal of Marital and Family Therapy*, *21*, 289–308. Retrieved from: http://www.coloradoeft.com/wp-content/uploads/2014/03/1995_Revision_of_the_DAS.pdf

Chesla, C. A., Fisher, L., Mullan, J. T., Skaff, M. M., Gardiner, P., Chun, K., et al. (2004). Family and disease management in African-American patients with type 2 diabetes. *Diabetes Care*, *27*, 2850–2855. https://doi.org/10.2337/diacare.27.12.2850.

Costa, V., Pereira, M. G., & Pedras, S. (2011). Partner support, social-cognitive variables and their role in adherence to self-monitoring of blood glucose in type 2 diabetes. *European Diabetes Nursing*, *9*, 81–86. https://doi.org/10.1002/edn.212

DeBerardis, G., Pellegrini, F., Franciosi, M., Belfiglio, M., DiNardo, B., Greenfield, S., et al. (2005). Are type 2 diabetic patients offered adequate foot care? The role of physician and patient characteristics. *Journal of Diabetes and Its Complications*, *19*, 319–327. https://doi.org/10.1016/j.jdiacomp.2005.02.005.

DeCoster, V. A., & Cummings, S. (2004). Coping with type 2 diabetes: Do race and gender matter? *Social Work in Health Care*, *40*, 37–53. https://doi.org/10.1300/J010v40n02_03.

Delamater, A. M. (2006). Improving patient adherence. *Clinical Diabetes*, *24*, 71–77. https://doi.org/10.2337/diaclin.24.2.71.

Dempster, M., McCarthy, T., & Davies, M. (2011). Psychological adjustment to type 2 diabetes and relationship quality. *Diabetic Medicine*, *28*, 487–492. https://doi.org/10.1111/j.1464-5491.2010.03214.x.

Farmer, A., Kinmonth, A. L., & Sutton, S. (2005). Measuring beliefs about taking hypoglycaemic medication among people with type 2 diabetes. *Diabetic Medicine*, *23*, 265–270. https://doi.org/10.1111/j.1464-5491.2005.01778.x.

Fisher, L. (2006). Family relationships and diabetes care during the adult years. *Diabetes Spectrum*, *19*, 71–73. https://doi.org/10.2337/diaspect.19.2.71.

Fisher, L., Chesla, C. A., Bartz, R. J., Gilliss, C., Skaff, M. A., Sabogal, F., et al. (1998). The family and type 2 diabetes: A framework for intervention. *Diabetes Educator*, *24*, 599–607. https://doi.org/10.1177/014572179802400504.

Fisher, L., Chesla, C. A., Skaff, M. A., Gilliss, C., Mullan, J. T., Bartz, R. J., et al. (2000). The family and disease management in Hispanic and European-American patients with type 2 diabetes. *Diabetes Care*, *23*, 267–272. https://doi.org/10.2337/diacare.23.3.267.

Fisher, L., Chesla, C., Skaff, M., Mullan, J., Chun, K., Kanter, R., et al. (2004). Patient-appraised couple emotion management and disease management among Chinese American patients with type 2 diabetes. *Journal of Family Psychology*, *18*, 302–310. https://doi.org/10.1037/0893-3200.18.2.302.

Fung, K. (2009). *Type 2 diabetes: A couples study on spousal relationship and health behaviors* [Honors Theses, Carnegie Mellon University]. Retrieved from: http://repository.cmu.edu/hsshonors/12

Gafvels, C., & Wandell, P. E. (2006). Diabetes strategies in men and women with type 2 diabetes in Swedish primary care. *Diabetes Research and Clinical Practice*, *71*, 280–289. https://doi.org/10.1016/j.diabres.2005.07.001.

Ganiyu, A. B., Mabuza, L. H., Malete, N. H., Govender, I., & Ogunbanjo, G. A. (2013). Non-adherence to diet and exercise recommendations amongst patients with type 2 diabetes mellitus attending Extension II Clinic Botswana. *African Journal of Primary Health Care & Family Medicine*, *5*, 1–6. https://doi.org/10.4102/phcfm.v5i1.457.

Garay-Sevilla, M. E., Nava, L. E., Malacara, J. M., Huerta, R., Díaz de León, J., Mena, A., et al. (1995). Adherence to treatment and social support in patients with NIDDM. *Journal of Diabetes and Its Complications*, *9*, 81–86. https://doi.org/10.1016/1056-8727(94)00021-F.

Gatt, S., & Sammut, R. (2008). An exploratory study of predictors of self-care behaviour in persons with type 2 diabetes. *International Journal of Nursing Studies*, *45*, 1525–1533. https://doi.org/10.1016/j.ijnurstu.2008.02.006.

Gonzalez, J., Peyrot, M., McCarl, L., Collins, E., Serpa, L., Mimiaga, M., et al. (2008). Depression and diabetes treatment non adherence: A meta-analysis. *Diabetes Care*, *31*, 2398–2403. https://doi.org/10.2337/dc08-1341

Guthrie, D. W., Bartsocas, C., Jarosz-Chabot, P., & Konstantinova, M. (2003). Psychosocial issues for children and adolescents with diabetes: Overview and recommendations. *Diabetes Spectrum*, *16*, 7–12. https://doi.org/10.2337/diaspect.16.1.7.

Hara, Y., Hisatom, M., Ito, H., Nakao, M., Tsuboi, K., & Ishihara, Y. (2014). Effects of gender, age, family support, and treatment on perceived stress and coping of patients with type 2 diabetes mellitus. *BioPsychoSocial Medicine*, *8*, 16. https://doi.org/10.1186/1751-0759-8-16.

Hernandez, J. (2008). Avaliação estrutural da Escala de Ajustamento Diádico [Structural evaluation of Dyadic Adjustment Scale]. *Psicologia em Estudo*, *13*, 593–601. https://doi.org/10.1590/S1413-73722008000300021.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural Equation Modelling: Guidelines for determining model fit. *Electronic Journal of Business and Research Methods*, *6*, 53–60. Retrieved from: https://arrow.dit.ie/cgi/viewcontent.cgi?article=1001&context=buschmanart

Horne, R. (2001). Non-adherence to medication: Causes and implications for care. In P. Gard (Ed.), *A behavioural approach to pharmacy practice* (pp. 111–130). Oxford: Blackwell.

Katon, W., Russo, J., Lin, E. H. B., Schmittdiel, J., Ciechanowski, P., Ludman, E., et al. (2012). Cost-effectiveness of a multicondition collaborative care intervention. *Archives of General Psychiatry*, *69*, 506–514. https://doi.org/10.1001/archgenpsychiatry.2011.1548.

Lane, J. D., McCaskill, C. C., Williams, P. G., Parekh, P. I., Feinglos, M. N., & Surwit, R. S. (2000). Personality correlates of glycemic control in type 2 diabetes. *Diabetes Care*, *23*, 1321–1325. https://doi.org/10.2337/diacare.23.9.1321.

Lloyd, C., Smith, J., & Weinger, K. (2005). Stress and diabetes: A review of the links. *Diabetes Spectrum*, *18*, 121–127. https://doi.org/10.2337/diaspect.18.2.121.

Mahfouz, E. M., & Awadalla, H. I. (2011). Compliance to diabetes self-management in rural El-mina, Egypt. *Central European Journal of Public Health*, *19*, 35–41. Retrieved from: http://apps.szu.cz/svi/cejph/archiv/2011-1-07-full.pdf

Mayberry, L. S., & Osborn, C. Y. (2012). Family support, medication adherence, and glycemic control among adults with type 2 diabetes. *Diabetes Care*, *35*, 1239–1245. https://doi.org/10.2337/dc11-2103.

McCubbin, H. I., Olson, D. H., & Larsen, A. S. (1987). Family crisis oriented personal evaluation scales (F-COPES). In H. I. McCubbin & A. I. Thompson (Eds.), *Family assessment inventories for research and practice* (pp. 195–207). Madison, WI: University of Wisconsin-Madison.

McCubbin, H., Patterson, J., & Wilson, L. (1981). *FILE: Family Inventory of Life Events and Changes*. St. Paul: University of Minnesota.

McDaniel, S. H., Doherty, W. J., & Hepworth, J. (2014). *Medical family therapy and integrated care*. Washington, DC: American Psychological Association.

Merrill, J. (2008). *Perceived spousal criticism, self-efficacy, and adherence to diet and exercise self-care behaviors in adults with type 2 diabetes*. [Master Thesis, Ohio University]. Retrieved from: http://etd.ohiolink.edu/send-pdf.cgi/Merrill%20Jennifer.pdf?ohiou1219417386

Miguel, L. S., & Sá, A. B. (2010). *Cuidados de Saúde Primários em 2011-2016: Reforçar, expandir [Primary Health Care in 2011-2016: Strengthen, expand]*. Retrieved from: http://www.opss.pt/sites/opss.pt/files/CSP1.pdf

Miller, D., & Brown, J. (2005). Marital interactions in the process of dietary change for type 2 diabetes. *Journal of Nutrition Education and Behavior*, *37*, 226–234. https://doi.org/10.1016/S1499-4046(06)60276-5.

Mosnier-Pudar, H., Hochberg, G., Eschwege, E., Virally, M. L., Halimi, S., Guillauseau, P. J., et al. (2009). How do patients with type 2 diabetes perceive their disease? Insights from the French DIABASIS survey. *Diabetes & Metabolism*, *35*, 220–227. https://doi.org/10.1016/j.diabet.2009.02.001.

Neff, L. A., & Karney, B. R. (2005). To know you is to love you: The implications of global adoration and specific accuracy for marital relationships. *Journal of Personality and Social Psychology*, *88*, 480–497. https://doi.org/10.1037/0022-3514.88.3.480.

Neto, M., Pimentel, J. P., Tavares, A., Araújo, F. O., & Guerreiro, A. C. (2015). *Perfil Regional de Saúde 2015: Região de Saúde Norte [Regional Health Profile 2015: North Health Region]*. Retrieved from: http://portal.arsnorte.min-saude.pt/portal/page/portal/ARSNorte/Conte%C3%BAdos/Sa%C3%BAde%20P%C3%BAblica%20Conteudos/PeRS_Norte_2015.pdf

Olson, D. H., McCubbin, H. I., Barnes, H., Larsen, A., Muxen, M., & Wilson, M. (1989). *Families: What makes them work*. London: Sage Publications.

Park, E., Tudiver, F., Schultz, J., & Campbell, T. (2004). Does enhancing partner support and interaction improve smoking cessation? A meta-analysis. *Annals of Family Medicine*, *2*, 170–174. https://doi.org/10.1370/afm.64.

Pedras, S., Pereira, M. G., & Ferreira, G. (2012). Influência das variáveis familiares nos autocuidados em diabéticos tipo 2. [Influence of family Variables on Type 2 Diabetes Self-Care]. In J. L. Ribeiro, I. Leal, A. Pereira, P. Vagos & I. Direito (Eds.), (Org.). *Livro de Atas do 9 Conferência Nacional de Psicologia da Saúde* (pp. 1064–1070). Retrieved from: http://www.placebo.pt/abrir/home/20.html

Pereira, M.G., Pedras, S., & Machado, J.C. (2014). Family variables as moderators between beliefs towards medicines and adherence to self care behaviors and medication in type 2 diabetes. *Family, Systems & Health*, *32*, 198–206. https://doi.org/10.1037/fsh0000029.

Polonsky, W. H., Fisher, L., Earles, J., Dudl, R. J., Lees, J., Mullan, J., et al. (2005). Assessing psychosocial distress in diabetes. *Diabetes Care*, *28*, 626–631. https://doi.org/10.2337/diacare.28.3.626.

Portuguese Society of Diabetes [PSD]. (2016). *Diabetes: Facts and Numbers. The Year of 2015*. Retrieved from: http://www.spd.pt/images/bolsas/dfn2015.pdf.

Powers, A. C. (2005). Diabetes mellitus. In D. Kasper (Ed.), *Harrison's Principles of Internal Medicine* (pp. 2160–2161). New York: McGraw-Hill.

Price, S., Price, C., & McKenry, P. (2010). Families coping with change: A conceptual overview. In S. Price, C. Price & P. McKenry (Eds.), *Families & change: Coping with stressful events and transitions* (4th ed, Chapter 1). Retrieved from: http://www.sagepub.com/upm-data/30979_Chapter1.pdf.

Ruddy, N., & McDaniel, S. H. (2002). Couple therapy and medical issues: Working with couples facing illness. In A. S. Gurman & N. S. Jacobson (Eds.), *Clinical Handbook of Couple Therapy* (pp. 699–716). New York: Guilford.

Ryan, P., & Sawin, K. (2009). The Individual and Family Self-management Theory: Background and perspectives on context, process, and outcomes. *Nursing Outlook*, *57*, 217–225. https://doi.org/10.1016/j.outlook.2008.10.004.

Saleh, F., Mumu, S. J., Ara, F., Hafez, A., & Ali, L. (2014). Non-adherence to self-care practices & medication and health related quality of life among patients with type 2 diabetes: A cross-sectional study. *BMC Public Health*, *14*, 431. https://doi.org/10.1186/1471-2458-14-431.

Schiøtz, M. L., Bøgelund, M., Almdal, T., Jensen, B. B., & Willaing, I. (2012). Social support and self-management behaviour among patients with Type 2 diabetes. *Diabetic Medicine*, *29*, 654–661. https://doi.org/10.1111/j.1464-5491.2011.03485.x.

Stephens, M. A., Rook, K. S., Franks, M. M., Khan, C., & Iida, M. (2010). Partners use of social control to improve diabetic patients dietary adherence. *Families, Systems, & Health*, *28*, 199–208. https://doi.org/10.1037/a0020513.

Surwit, R. S. (2002). Type 2 diabetes and stress. *Diabetes Voice*, *47*, 38–40. Retrieved from: https://www.idf.org/sites/default/files/attachments/article_108_en.pdf

Talbot, F., Nouwen, A., Gingras, J., Gosselin, M., & Audet, J. (1997). The assessment of diabetes-related cognitive and social factors: The Multidimensional Diabetes Questionnaire. *Journal of Behavioral Medicine*, *20*, 291–312. https://doi.org/10.1023/A:1025508928696.

Thoolen, B. J., De Ridder, D., Bensing, J., Gorter, K., & Rutten, G. (2006). Psychological outcomes of screen-detected patients with type 2 diabetes: The influence of time since diagnosis and treatment intensity. *Diabetes Care*, *29*, 2257–2262. https://doi.org/10.2337/dc06-0617.

Tiv, M., Viel, J.-F., Mauny, F., Eschwège, E., Weill, A., Fournier, C., et al. (2012). Medication adherence in type 2 Diabetes: The ENTRED study 2007, a French population-based study. *PLoS ONE*, *7*, e32412. https://doi.org/10.1371/journal.pone.0032412.

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The Summary of Diabetes Self-Care Activities Measure: Results from 7 studies and a revised scale. *Diabetes Care*, *23*, 943–950. https://doi.org/10.2337/diacare.23.7.943.

Trief, P. M., Himes, C., Orendorf, R., & Weinstock, R. S. (2001). The marital relationship and psychosocial adaptation and glycemic control of individuals with diabetes. *Diabetes Care*, *24*, 1384–1389. https://doi.org/10.2337/diacare.24.8.1384.

Trief, P. M., Morin, P. C., Izquierdo, R., Teresi, J. A., Eimicke, J. P., Goland, R., et al. (2006). Depression and glycemic control in elderly ethnically diverse patients with diabetes. *Diabetes Care*, *29*, 830–835. https://doi.org/10.2337/diacare.29.04.06.dc05-1769.

Trief, P. M., Ploutz-Snyder, R., Britton, K. D., & Weinstock, R. S. (2004). The relationship between marital quality and adherence to the diabetes care regimen. *Diabetes Care*, *27*, 148–154. https://doi.org/10.1207/s15324796abm2703_2.

Trief, P. M., Sandberg, J., Greenberg, R., Graff, K., Castronova, N., Yoon, M., et al. (2003). Describing support: A qualitative study of couples living with diabetes. *Families, Systems & Health*, *21*, 57–66. https://doi.org/10.1037/h0089502.

Trief, P. M., Sandberg, J., Jonathan, G., Ploutz-Snyder, R., Brittain, R., Cibula, D., et al. (2011). Promoting couples collaboration in type 2 diabetes: The diabetes support project pilot data. *Families, Systems, & Health*, *29*, 253–261. https://doi.org/10.1037/a0024564.

Trief, P. M., Wade, M. J., Britton, K. D., & Weinstock, R. S. (2002). A prospective analysis of marital relationships factors and quality of life in diabetes. *Diabetes Care*, *25*, 1154–1158. https://doi.org/10.2337/diacare.25.7.1154.

Valdez, R. (2009). Detecting undiagnosed type 2 diabetes: Family history as a risk factor and screening tool. *Journal of Diabetes Science and Technology*, *3*, 722–726. https://doi.org/10.1177/193229680900300417.

World Health Organization [WHO]. (2003). *Adherence to long-term therapies: Evidence for action*. Retrieved from: http://www.who.int/chp/knowledge/publications/adherence_report/en/

World Health Organization [WHO]. (2016). *10 facts about diabetes*. Retrieved from: http://www.who.int/features/factfiles/diabetes/en/