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Original Article

# Type 1 and 2 Diabetes Mellitus: interference of vascular and neurological complications in occupational performance

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**Abstract:** Introduction: Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia and associated with complications. It is considered a chronic degenerative disease. Objective: This study aimed to identify which areas of human occupation suffered performance changes as a result of vascular and neurological complications of type 1 and 2 diabetes mellitus. Method: This is a quantitative study with exploratory approach. The data collection occurred in a University Hospital located in a city in the central region of Rio Grande do Sul, and used a sociodemographic questionnaire and the Canadian Occupational Performance Measure (COPM). Data were analyzed by Spearman's rank correlation coefficient using the software *Statistical Package for Social Science* 15.0 (SPSS). Results: The sample consisted of 10 people with vascular and neurological complications resulting of type 1 and 2 diabetes mellitus, with 80% men and 20% women. The most frequently cited occupational performance problems were in self-care activities (feeding, bathing and mobility), while the most affected productivity tasks were cooking and leisure activities such as walking and socializing. Conclusion: The data alert us to the work of occupational therapists caring for people with diabetes in all health care levels.

**Keywords:** *Diabetes Mellitus, Task Performance and Analysis, Occupational Therapy.*

## Diabetes *Mellitus* tipo 1 e 2: interferência das complicações vasculares e neurológicas no desempenho ocupacional

**Resumo:** Introdução: Diabetes *Mellitus* (DM) é um grupo de doenças metabólicas caracterizadas por hiperglicemia e associadas a complicações. É considerada como uma doença crônico-degenerativa. Objetivo: Este estudo teve como objetivo identificar quais as áreas da ocupação humana sofreram alterações de desempenho em decorrência das complicações vasculares e neurológicas resultantes da DM tipo 1 e 2. Método: Trata-se de um estudo quantitativo de abordagem exploratória. A coleta de dados ocorreu em um hospital universitário localizado em um município da região central do Rio Grande do Sul. Utilizou-se um questionário sociodemográfico e a Medida Canadense de Desempenho Ocupacional (COPM). Os dados foram analisados pelo Teste de Correlação de *Spearmann* através do *software Statistical Package for Social Science* 15.0 (SPSS). Resultados: A amostra foi de 10 pessoas com complicações vasculares e neurológicas resultantes da DM tipo 1 e 2, sendo 80% homens e 20% mulheres. Os problemas de desempenho ocupacional mais citados foram na área do autocuidado (alimentação, banho e mobilidade), na área de produtividade foi cozinhar e na área de lazer foi passear e a socialização. Conclusão: Os dados nos alertam para a atuação dos terapeutas ocupacionais na linha de cuidado de pessoas com Diabetes, em todos os níveis de atenção à saúde.

**Palavras-chave:** *Diabetes Mellitus, Análise e Desempenho de Tarefas, Terapia Ocupacional.*

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# 1 Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia and associated with complications, dysfunctions and insufficiency of several organs, especially eyes, kidneys, nerves, brain, heart and blood vessels (BRASIL, 2006). DM is considered a chronic-degenerative disease, commonly associated with severe endocrine changes, which vary according to the type of DM and its main effect is the elevation of plasma glucose concentration (MODENEZE, 2004).

DM grows at a rate of nine million new cases per year (SHAW; SICREE; ZIMMER, 2010). The population of diabetics in Brazil in 2010 was eight million, and it is estimated that in 2025 the Brazilian population with diabetes will be 17.6 million (BAZOTTE, 2010). Because it is a chronic disease, DM accompanies the person throughout life, so these people have some characteristics with limitations on functional abilities. Therefore, the outpatient support of a multi-professional team is considered important, as it acts as a facilitator, aiming at minimizing the problems that may arise as a consequence of the disease.

The diabetic population with a low socioeconomic level, with inadequate hygiene conditions and poor access to health services, has a higher risk of being submitted to amputation, because when arriving at the health service, the lesions usually are advanced, requiring a surgical procedure of high complexity (ASSUMPÇÃO et al., 2009).

One of the main causes of hospitalization of people with DM is the diabetic foot, a complication that affects the lower limbs (MILMAN, 2001; CAIAFA et al., 2011). "Diabetic foot is a problem with a high social and economic weight, jeopardizing the sustainability of the Health and Social Security Systems of any country [...]" (NEVES et al., 2013, p. 20).

Diabetic foot is characterized by changes of neurological, vascular and infectious origin. It can occur alone or together, affecting the feet of people with DM, opposing the concept of limb compromised by necrosis and infection, a reality found in the health services that serve this population, as a result of lack of prevention, early diagnosis, care and more resolutive treatment in the early stages of the disease (CAIAFA et al., 2011).

The impairments caused by diabetic foot are one of the main causes of non-traumatic lower limb amputation, being an important factor of incapacity, disability, early retirement and deaths that could be avoided (MILMAN, 2001; BATISTA; LUZ, 2012; REIS; CASA JUNIOR; CAMPOS, 2012). These amputations

> [...] are preceded by ulcers, characterized by cutaneous lesions with loss of the epithelium, which extend to the dermis or pierce it and reach the deeper tissues sometimes involving bones and muscles (VIGO; PACE, 2005, p. 100).

DM requires a variety of care and knowledge, such as measuring blood glucose, exercising regularly, taking care of food, for example. DM can reach both simple everyday activities and the most complex activities related to human occupation. The occupational therapist has to stick to the good occupational performance of the subject among his functions, optimizing his functionality (TOSCANO, 2011).

Occupational performance is the subjects´ abilities to follow and maintain a daily routine, to play social roles and tasks that aim at self-care, productivity and leisure (ZANNI; BIANCHIN; MARQUES, 2009).

Several factors influence changes in the participant´s occupational performance, such as lack of prevention, lack of knowledge of the disease, lack of post-diagnosis guidelines, lack of care related to Activities of Daily Life (ADL), Instrumental Activities of Daily Living (IADL) and fragility of Primary Health Care services. In this way, the person affected by DM returns to the hospital, with other complications due to the lack of care and control of DM.

The occupational therapist is the professional who must compose the multi-professional teams that provide care and treatment to the person with DM, this professional is

> [...] able to identify in the daily life of the domestic, practical and work lives the possible actions that may be corroborating in the prolongation of the ill and dependent life, whether emotional or physical (TOSCANO, 2011, p. 6).

This study aimed to identify which areas of human occupation suffered performance changes due to the vascular and neurological complications resulting from DM type 1 and 2.

# 2 Method

This study is quantitative and exploratory research. It was approved by the Committee on Ethics in Research on Human Beings of the reference

institution under the consubstantiated opinion nº 083632/2013.

Participants diagnosed with type 1 or type 2 DM who presented vascular and neurological complications in the lower limbs of both genders, aged 18 years and over, of all ethnic groups and social classes were selected for this study and who agreed to participate in the research through science and agreement with the signing of the Informed Consent Term (TCLE). This study was performed in a hospital located in the central region of Rio Grande do Sul, RS. The unit where the data collection took place was the Vascular Clinic Outpatient Clinic, for which participants who present ulcerations or any other complications in the lower limbs as a result of DM are referred for treatment. The sample of this study was 10 participants and the period of data collection was from February to August of 2013.

This collection had two instruments, which were answered in a single meeting.

The first instrument was a sociodemographic questionnaire, with the data collected regarding the life history, history of the disease, social aspects, and everyday aspects. The second instrument was the Canadian Occupational Performance Measure (COPM). This is a specific protocol of Occupational Therapy, aiming to identify problems, desires, and actions related to occupational performance, classified as the degree of importance, punctuating and classifying each problem to performance and satisfaction of the subject. It is an evaluation through self-perception of the client in their occupational performance in the areas of self-care, productivity, and leisure (LAW et al., 2009).

This instrument aims to identify problems, concerns, and issues related to occupational performance. Initially, the participants were asked about their daily activities that refer to productive activities, self-care, and leisure. At this point, they are asked to identify the activities in which they have a problem, and then to grade the importance of each activity on a scale of 1 to 10. To conclude, the five most important problems recorded are confirmed, and the total score is calculated (LAW et al., 2009). Since it was an exploratory research, there was no reevaluation.

The data referring to this study were processed and analyzed electronically. Firstly, a database was built in the Excel 2007 program, and then the data were analyzed in the Software Statistical Package for Social Science 15.0 (SPSS).

The Spearmann Correlation Test was used to analyze the relationship between importance, performance, and satisfaction within the dimensions defined as self-care, productivity and leisure. Correlation is an associative technique that helps to determine if there is a coherent and systematic relationship between two or more variables (HAIR et al., 2005). The consideration to interpret the data is: ≥0.70 positive or negative indicates a strong correlation; 0.30< × <0.70 positive or negative indicates moderate correlation; and 0< × <0.30 indicates a poor correlation.

## 3 Results and Discussion

The sample was composed of 10 participants, of both genders, being 80% male (Table 1), with a mean age of 55 (± 7.55) years old and 20% female (Table 1), mean age of 79.5 (±5.0) years old. Studies performed in all Brazilian regions in 2008 showed a prevalence of DM in females. In the South region, prevalence was observed among women aged 70 to 79 years old, around 21.5% (FREITAS; GARCIA, 2012). However, male (in the same age group) presented a higher prevalence in the Center-West region, around 17.3%. Subjects with advanced age are the ones with the highest DM diagnosis in both genders. This pathology occurs in less than 1.0% of

**Table 1.** Distribution of health/disease conditions among the participants surveyed.

| Variables | Frequency | Percentage % |
|---|---|---|
| **Gender** | | |
| Female | 2 | 20 |
| Male | 8 | 80 |
| **Visit of Community Health Agent** | | |
| No | 5 | 56 |
| Yes | 4 | 44 |
| **Type of Diabetes** | | |
| I | 3 | 30 |
| II | 7 | 70 |
| **Other pathologies** | | |
| No | 2 | 20 |
| Yes | 8 | 80 |
| **Ulcers** | | |
| No | 8 | 80 |
| Yes | 2 | 20 |
| **Amputations** | | |
| No | 2 | 20 |
| Yes | 8 | 80 |
| **Nutritional Guidance** | | |
| No | 3 | 30 |
| Yes | 7 | 70 |
| **Physical Activity** | | |
| No | 9 | 90 |
| Yes | 1 | 10 |

the participants between 18 and 29 years old and more than 10.0% of the participants aged 60 years or older (FREITAS; GARCIA, 2012).

The prevalence of DM diagnosed in males (80%) can be observed in this study (Table 1). This data can be justified because women are "[...] more concerned with health and seek more care and experience greater self-care than men [...]" (PETERMANN et al., 2015, p. 51). Another factor pointed out by some surveys is the culturally constructed model of masculinity. In this view, man is stronger and less ill than women (a thought that must be socially constituted). This idea contributes to the development of different health care standards (ALVES et al., 2011). Access to health care is also seen as an obstacle. A study by Gomes, Nascimento and Araujo (2007) presents some aspects that can be considered as barriers by men, which are related to work, accessibility, the specificities of the professional teams and the structure of operation of these services. The professions referred by the interviewees are the most varied, as a farmer, household, gossip, tradesman, mechanic among others, but at the time of the evaluation, all were far from their work activities. Studies have pointed out that complications from DM "[...] affect work productivity and functional capacity, resulting in disability retirement, as well as restricting activities of daily living and leisure" (SALOMÉ; BLANES; FERREIRA, 2012, p. 127).

Regarding health follow-up, 44% of the subjects reported that they are frequently followed by the Community Health Agent (ACS) of the Basic Health Unit of their region (Table 1). In 2001, the Ministry of Health proposed the Plan for Reorganization of Care to Systemic Arterial Hypertension (HBP) and DM, recognizing the importance of Basic Care in the approach to these diseases, made through the HIPERDIA (System of Registration Monitoring of Hypertensive and Diabetic) enabling a comprehensive humanized attention, the development of continuous actions with the purpose of increasing the socialization, independence and autonomy of this population (BRASIL, 2011).

Regarding the actions carried out by the HIPERDIA program, participants with DM can count on the Strategic Action Plan for Coping with Noncommunicable Chronic Diseases (DCNT) in Brazil, 2011-2022, which defines and prioritizes the necessary actions and investments to prepare the country to confront and stop NCDs in the next ten years. The plan prioritizes several actions aimed at encouraging healthy eating, physical activity, prevention of tobacco and alcohol consumption, as priorities of the Brazilian government (BRASIL, 2011).

Analyzing the results presented in Table 1, it is observed that most subjects (70%) have a diagnosis of type 2 DM. Type 2 DM is among the

> [...] chronic diseases that represent a serious public health problem due to the high prevalence in the world [...], morbidity and being one of the main cardiovascular and cerebrovascular risk factors (MENDES et al., 2011, p. 1233).

When analyzing the data referring to other pathologies, it was observed that 80% of the subjects have some other pathology associated with DM, the most common were hypertension. Four people cited other pathologies, such as heart disease, renal disorders, and impaired visual acuity.

> The natural history of DM is marked by the appearance of chronic complications, usually classified as microvascular - retinopathy, nephropathy and neuropathy - and macrovascular - coronary artery disease, cerebrovascular and peripheral vascular disease. All of them are responsible for expressive morbidity and mortality, with cardiovascular and renal mortality rates, blindness, limb amputation and loss of function and quality of life, much higher than individuals without DM (BRASIL, 2006, p. 34).

Only two participants had ulcerative lesions, and the distal tibia region was affected in both cases. It was observed that 80% of the subjects underwent a surgical procedure for amputation, mainly the fingers as the affected foot region. DM is the first cause of lower limb amputation in Brazil (BRASIL, 2006). Ulcerative complications and amputations presented by DM subjects lead to changes in style and quality of life (SALOMÉ et al., 2012; SALOMÉ; BLANES; FERREIRA, 2012; ALMEIDA et al., 2013). In this way, it is necessary an outpatient follow-up in a hospital unit in the vascular specialty for medical care, dressings, and rehabilitation.

When asked about food care, seven (70%) participants reported receiving nutritional guidelines (Table 1). Despite the incentives to practice physical activities, only one (10%) of the subjects reported doing them daily (Table 1). It was observed that the population is following the nutritional guidelines and taking greater care with food but still, prevails the negligence with the practices of physical activities. Therefore, it is perceived need for clarification and awareness about the importance and the benefit of this practice to control these pathologies.

The time of knowledge of the pathology by the participants is different from the time of treatment (Table 2), that is, some participants are slow to start treatment, even knowing the pathology. On average, participants in this study took approximately three years to begin treatment after receiving the diagnosis.

There were doubts regarding certain aspects of treatment, especially regarding prescribed medication, and the several restrictions found during treatment, such as changing eating habits, adherence to physical exercise, factors that cause the onset being delayed (MATTOS, 2009).

Study participants reported difficulty in feeding, bathing and mobility (Figure 1). Food was highlighted as a factor of importance in the daily lives of people affected by DM, not because they can not perform the task of preparing food, but because of the dietary restrictions that accompany the disease. Above all, through dietary restrictions, the diabetic becomes aware of his limitations. For this reason, the conflict between the alimentary desire and the essential need to contain it is always present in the daily life of diabetic participants (SANTOS et al., 2005).

From the data collected by the COPM (Figure 1), the participants of this study pointed out limitations in daily activities, such as bathing, mobility, shopping, clothing, independence, driving and transportation. Such limitations may be caused by pressure ulcers and amputations, also causing changes in daily life, with more limitations and new experiences. Therefore, the daily life of a diabetic

> [...] can be a challenge both to the person and those who are close to him, because the condition of being diabetic and amputated affects life as a whole, drastically altering daily life (BATISTA; LUZ, 2012, p. 245).

The restrictions brought by the amputation are not limited only to aesthetic, anatomical, functional and mobility factors. The subject undergoing a surgical procedure for amputation has his entire existence altered. He begins to feel incomplete, ending up reaching his self-esteem, so activities that were previously carried out with pleasure, such as ADL, IADL, work and leisure activities, are now

**Table 2.** Relationship between the time of knowledge and the time of treatment of DM.

| Variables | Average (±SD) | Minimum | Maximum |
|---|---|---|---|
| Time of knowledge | 11.30 (±4.8) | 8 | 20 |
| Time of Treatment | 8.6 (±5.0) | 1 | 20 |

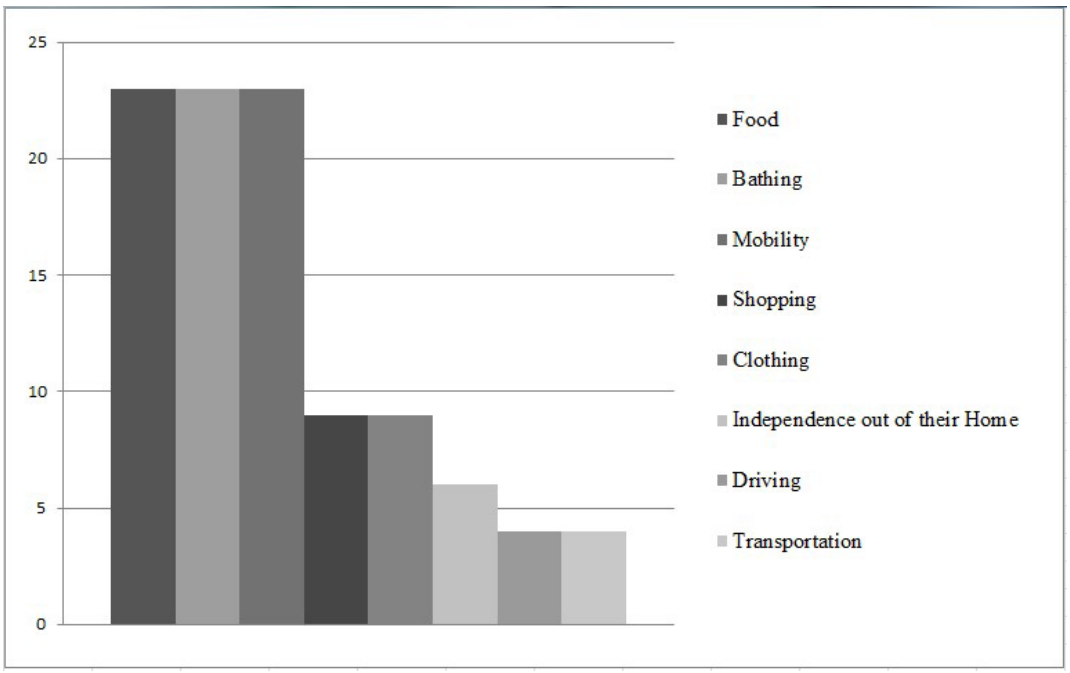


**Figure 1.** Factors related to self-care cited by the participants.

left aside and give way to feelings of impotence, depression, social isolation, impoverishment of self-image (BATISTA; LUZ, 2012). For Chini and Boemer (2007, p. 332),

> Losing a part of the body is to have altered an entire existence, it is to live an incompleteness bringing with it a series of changes in the existing. It is having to adapt/readapt, learn to live again, now assuming another perspective in the world for oneself, for others, for the objects.

Analyzing the data in Table 3, the average importance is always greater than the performance and satisfaction. Mobility was the factor in which the study participants had greater limitations, in this item the average performance was 2.6, and the satisfaction was 3. This result is a consequence of the high number of amputations that implies the reduction of mobility, both in external and internal environments. Thus, the activities that involve the displacement are impaired and, consequently, the performance and the satisfaction have low averages.

The complications presented by the participants of this study were limited to ulcers and amputations, but studies already indicate that these are not the only complications that affect diabetics. They may present changes of musculoskeletal origin, such as: Rigid Hands Syndrome, Dupuytren's Contracture, Finger Triggers or Stiff Tenosynovitis of Finger Flexors, Shoulder Capsulitis, Calcified Shoulder Periarteritis, Carpal Tunnel Syndrome (STC), Diffuse Idiopathic Skeletal Hyperostosis (DISH) and Charcot Arthropathy (LEBIEDZ-ODROBINA; KAY, 2010; ARKKILA; GAUTIER, 2003). It is also observed the appearance of Crystal Arthritis, Infections, Osteoporosis, and Osteoarthritis (BURNER; ROSENTHAL, 2009). Several authors have sought to classify the joint manifestations of DM (ARKKILA; GAUTIER, 2003; CRISPIN; ALCOCER-VARELA, 2003), a complex task since most of the pathophysiological mechanisms are clear (SILVA; SKARE, 2012).

Figure 2 shows the factors cited by participants defined as important in productivity. It was found that the most cited factor was "cooking" followed by working. Again, the food associated with the

**Table 3.** Descriptive analysis of the factors cited by participants – Self-care.

| Self-care variables | Importance Average (±SD) | Performance Average (±SD) | Satisfaction Average (±SD) |
|---|---|---|---|
| Food | 9.8 (±0.45) | 8.6 (±0.55) | 8.4 (±1.8) |
| Bathing | 9.8 (±0.45) | 8.0 (±1.41) | 9.0 (±1.15) |
| Mobility | 9.8 (±0.45) | 2.6 (±2.41) | 3 (±3.00) |

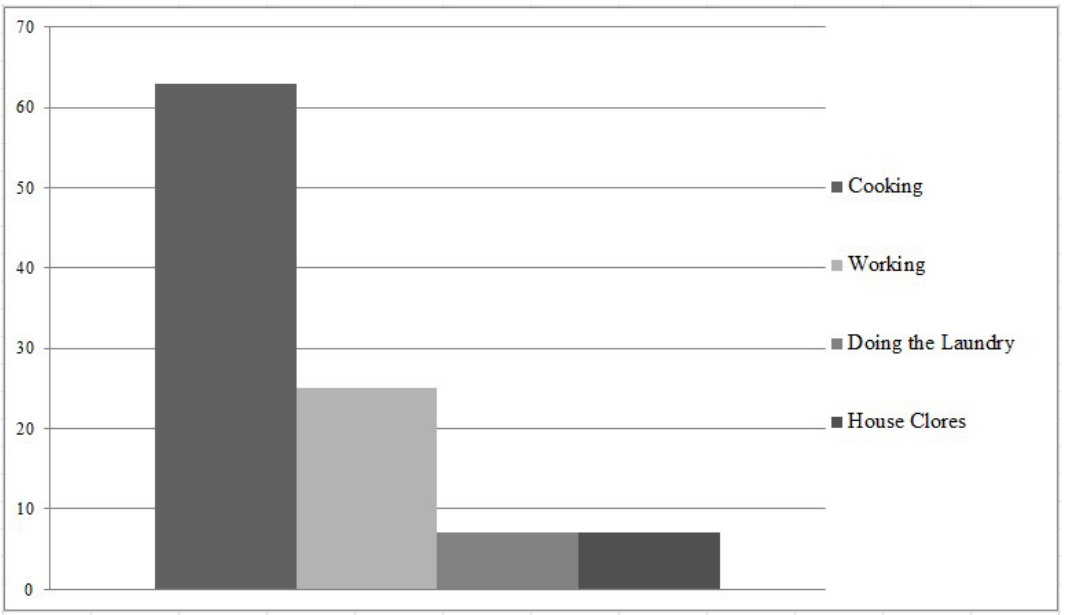


**Figure 2.** Factors cited by the participants in their productivity.

cooking demonstrates that this action has great importance in the lives of people with DM.

Once diagnosed as DM, changing habits regarding food, is a slow and complicated process, since these habits are related to three complex factors: cultural and family history, the economic factor such as costs, and finally to social factors, related to eating patterns. Violation and desire for food are always present in the life of the person with diabetes (SIQUEIRA et al., 2007).

There is a significant correlation between performance and satisfaction in self-care, as the performance in productive activities increases, there is an increase in satisfaction of the subjects about self-care. There is no significant correlation between importance and performance and importance with satisfaction (Table 4).

The average importance of the participants in the cooking activity was 9.5 (±1.8), higher than the mean performance, which was 6.2 (±2.6) of their achievement and satisfaction 8.3 (±2.3) with the results of the completed task. The practice of a productive activity is very important for the participant with DM. It influences healthy living, maintaining ties beyond the walls of their home, giving the person with DM autonomy and independence. However, people´s physical spaces and attitudes can become barriers to the achievement of participation in society and remain autonomous (WORLD..., 2001).

Figure 3 shows the leisure activities that the study participants pointed out as most affected: walking (21%), finding friends (21%), traveling (14%) and playing cards (14%). Authors such as Salomé, Blanes and Ferreira (2009), Salomé et al. (2012), Salomé, Blanes and Ferreira (2012) and Almeida et al. (2013) affirm in their studies that the impact caused by DM on the life of the affected participants ends up restricting the execution of social activities, leisure, and family life and, as seen above, limiting work

**Table 4.** Correlation of importance, performance, and satisfaction in their productivity.

| Correlation | Correlation coefficient | P-value | Test Decision |
|---|---|---|---|
| **Importance x Perfromance** | –0.26 | 0.43 | Non-significant correlation |
| **Importance x Satisfaction** | –0.14 | 0.68 | Non-significant correlation |
| **Performance x Satisfaction** | 0.67 | 0.03 | Significant positive correlation |

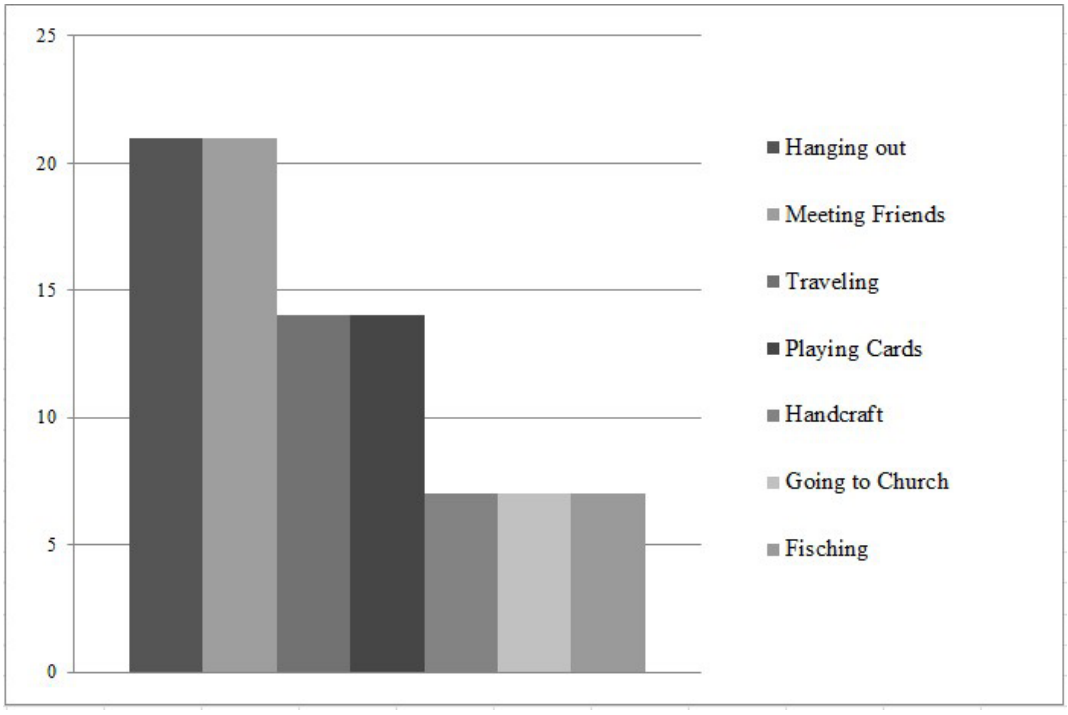


**Figure 3.** Factors cited by the participants regarding leisure activities.

**Table 5.** Correlation of importance, performance, and satisfaction in leisure.

| Correlation | Correlation coefficient | P-value | Test Decision |
|---|---|---|---|
| **Importance x Performance** | –0.141 | 0.680 | Non-significant correlation |
| **Importance x Satisfaction** | –0.357 | 0.311 | Non-significant correlation |
| **Performance x Satisfaction** | 0.961 | <0.0001 | Significant positive correlation |

activities and even loss of work functions in the productive age group.

With the results presented in Table 5, there is a significant correlation between performance and satisfaction than leisure. For the other variables, there was no significant correlation. Studies point out that, as these subjects

> [...] demonstrate some dependence on managing their activities, being at home, leisure and social and family environments may have their autonomy impaired, becoming automatically dependent on their relatives and friends (ALMEIDA et al., 2013, p. 145).

This study reinforces the need to redirect attention to the health of subjects with DM. Future studies should be conducted aiming at increasing the size of the sample, seeking to identify the real needs of this population in the municipality under study, aiming the contribution of the organization of strategic multi-professional actions to better assist this population.

## 4 Conclusion

Participants with vascular and neurological complications have limitations in their daily activities such as meal preparation, mobility, bathing and leisure, highlighted as problems of greater importance for this population. These complications directly affect the occupational performance of the participants of this study.

Being the occupational performance object of study of the Occupational Therapy and being this intertwined with the daily of the participant and the abilities to maintain the daily routine, the necessity of this professional in multi-professional teams in the line of attention to the health of people with DM, in all levels of health care, whether in primary, secondary or tertiary care is highlighted.

Mobility and leisure restrictions need to be analyzed to identify the subjects' needs and seeking alternatives for the participant to achieve autonomy in their activities, considering the environment in which the participant lives and the architectural or attitudinal barriers or facilitators that surround him, aiming at their integration with the environment. Therefore, it is necessary to invest in an integral care of the participant with DM and their families, tracing multi-professional strategies of caring.

The sample is a limiting factor in this study and justified by the number of participants with vascular and neurological complications who were being followed up at the Vascular Clinic Outpatient Clinic of this hospital during the period in which data collection occurred.

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## Author's Contributions

All authors contributed to the design of the text and approved the final version of the text.