An analysis of Women with Type 2 Diabetes Mellitus (T2DM) on Diabetes Self-Care, Diabetes Time Management, and Diabetes Distress

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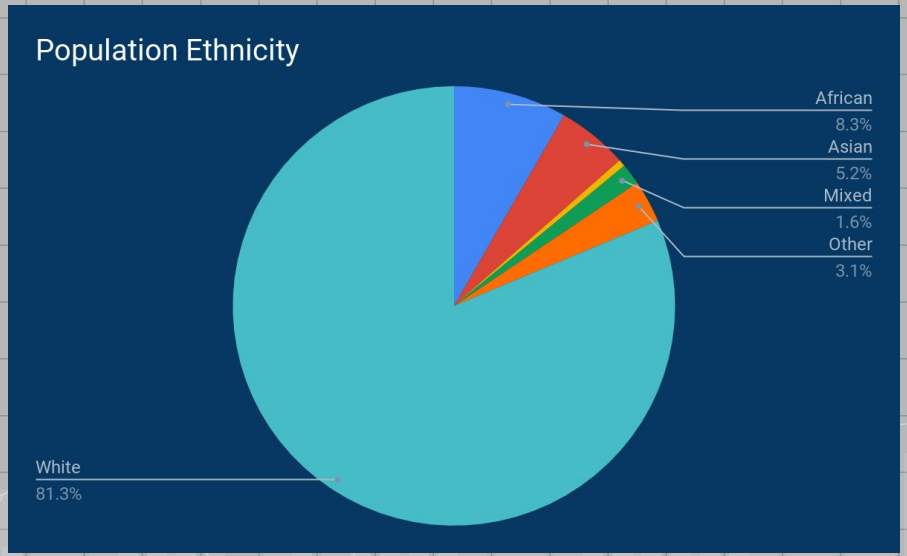
Outline

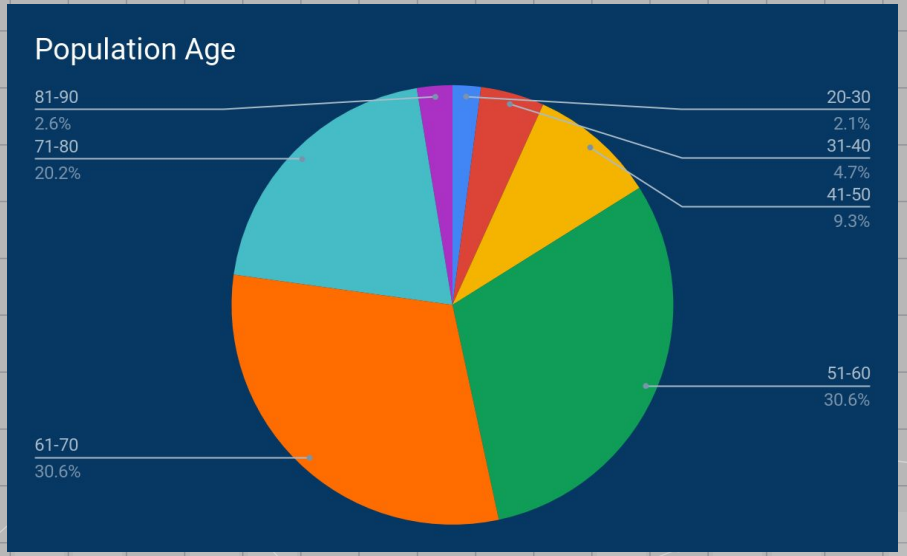
- Introduction
- Data Preparation
- Data Exploration
- Data Modeling
- Conclusion

Introduction

Sample Population (Demographics)

Women 18 years and older who are currently diagnosed with T2DM and have been for greater than one year.





Overarching Research Question

What are the relationships between and among diabetes self-care, diabetes time management, and diabetes distress in women with T2DM?

Survey Questions

The survey was divided into 5 segments:

01	Eligibility	• Compromised of 7 questions
02	Diabetes Self-Management Questionnaire (DSMQ)	• Compromised of 16 questions • Developed by Dr. Andreas Schmitt (2013)
03	Diabetes Time Management Questionnaire (DTMQ)	• Compromised of 49 questions • Developed by Dr. Celeste Gafarian (1999)
04	Diabetes Distress Scale (DDS)	• Compromised of 17 questions • Developed by Dr. William Polonsky (2005)
05	Demographic Profile	• Compromised of 17 questions

Data Preparation

Incomplete and Ineligible Data

Invalid	• No questions answered • 25 participants
Ineligible	• Answered “FALSE” in the first 7 preliminary questions • 46 participants
Abandoned	• Answered “TRUE” in the first 7 preliminary questions but then did not complete every question in the rest of the survey • 13 participants
Outliers	• Participants who had scores extremely higher or lower than the rest of the data • 5 participants

188/277 participants left for the data analysis

Working With Two Datasets

Two Datasets:	Description:
1. From Electronic Version	Reached participants by email in several different states
2. From Paper Version	Limited to suburban Philadelphia (Bucks County and Montgomery County)

From these two datasets, we found:

- Inconsistencies with question numbering
- Additional questions in electronic version

Merging the Datasets

Deletion	Matching	Renaming	Renumbering	Merging
Deleted excess columns in electronic version - Ex: Time started/Time finished, IP Address, Duration, etc...	Matched the questions in datasets with the appropriate responses	Renamed all of the columns to match which section of the survey they were from - Added “R” in columns’ names to mark them as reversed questions	Renumbered columns to match both versions	Used R to merge the datasets

Converting to Numeric

- Used R to clean the datasets
- Coded responses on a numeric scale that matched the scoring of each survey section
- “Dummy Columns” were made for questions in which more than one answer was possible
  - (Ex. Caregiver Role; Self, Children, Partner, Parent)

Scoring of the Questions

- **DSMQ**
  - 0 - 3 (0 = does not apply to me ; 3 = applies to me very much)
  - Total Score is between 0 - 10 ; **10 = best**
- **DTMQ**
  - 1 - 5 (1 = Always ; 5 = Never)
  - Total Score is between 1 - 10 ; **10 = worst**
- **DDS**
  - 1 - 6 (1 = Not a problem ; 6 = A very serious problem)
  - Total Score is between 1 - 6 ; **6 = worst**

- Some questions were reverse scored:

Ex. DSMQ:

"I take my diabetes medication (example: insulin, tablets) as prescribed (very accurately)."

vs.

"Occasionally I eat lots of sweets or other foods rich in carbohydrates (more often than would be good)."

Data Dictionary

Data Dictionary outlining a Database on Women With Type 2 Diabetes Mellitus

Field Name	Data Type	Data Format	Field Size	Description
99	Ordinal	NN	2	Missing Answer
Eligibility (Q1-Q7)				
1	Ordinal	N	1	TRUE
2	Ordinal	N	1	FALSE
Diabetes Self Management (DSMQ1- 4, 6, 8, 9)				
0	Ordinal	N	1	Does not apply to me
1	Ordinal	N	1	Applies to me to some degree
2	Ordinal	N	1	Applies to me to a considerable degree
3	Ordinal	N	1	Applies to me very much
Diabetes Self Management (Reverse Scoring) (DSMQR 5, 7, 10- 16)				
0	Ordinal	N	1	Applies to me very much
1	Ordinal	N	1	Applies to me to a considerable degree
2	Ordinal	N	1	Applies to me to some degree
3	Ordinal	N	1	Does not apply to me

Data Exploration

Total Scores and Subscores Breakdown

Table

Mean, Standard Deviation, Median, Range, and Cronbach's Alpha of the Diabetes Self-Management Questionnaire, Diabetes Time Management, and Diabetes Distress Scale (N = 188).

Instrument	Range	Median	Mean	SD	Alpha
Diabetes Self Care	5.8	7.29	7.11	1.40	.791
Subscale Dietary Control	10	5.83	5.55	1.98	.664
Subscale Glucose Management	10	8.0	7.83	1.85	.669
Subscale Physical Activity	10	6.66	6.01	2.74	.743
Subscale Physician Contact	7.77	10	8.97	1.76	.527
Diabetes Time Management	4.2	5.02	4.98	0.83	.892
Diabetes Distress Scale	5	1.94	2.24	1.05	.938
Subscale Emotional Burden	5	2.2	2.45	1.28	.905
Subscale Physician Distress	5	1	1.57	1.15	.920
Subscale Regimen Distress	5	2.2	2.61	1.35	.901
Subscale Interpersonal Distress	5	1.66	2.18	1.37	.779

Pearson's Correlation with Total Scores

Table

Means, Standard Deviations, and bivariate correlations (Pearson's) for main study variables (N=188)

Variable	M	SD	1	2	3
1. Diabetes Self Care	7.1	1.4	-	-.605**	-.331**
2. Diabetes Time Management	4.9	0.83	-.605**	-	.394**
3. Diabetes Distress	2.2	1.05	-.331**	.394**	-

**$p < 0.01$ level

- Highest correlated total score: DSMQ and DTMQ (-.605)
- DSMQ and DDS (-.331)
- DTMQ and DDS (.394)

Pearson's Correlation with Subscores and DTMQ

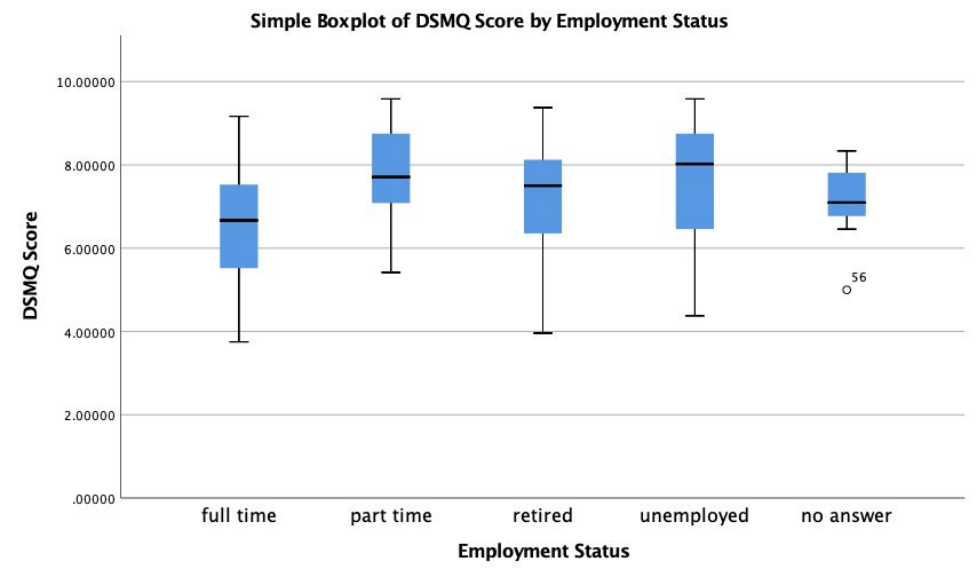
Table
Pearson's Correlations among subscales (n=188)

Variable	1	2	3	4	5	6	7	8	9
1. DSMQ Glucose Management	1	.367**	.215**	.303**	-.117	.022	-.399**	.002	-.435**
2.DSMQ Dietary Control	.367**	1	.425**	.075	-.202**	.029	-.456**	-.145*	-.439**
3.DSMQ Physical Activity	.215**	.425**	1	.047	-.116	.019	-.308**	-.085	-.449**
4.DSMQ Physician Contact	.303**	.075	.047	1	-.091	-.239**	-.215**	-.073	-.195**
5.DDS Emotional Burden	-.117	-.202**	-.116	-.091	1	.396**	.740**	.665**	.346**
6.DDS Physical Distress	.022	.029	.019	-.239**	.396**	1	.388**	.452**	.137
7.DDS Regimen Distress	-.399**	-.456**	-.308**	-.215**	.740**	.388**	1	.570**	.472**
8. DDS Interpersonal Distress	.002	-.145*	-.085	-.073	.665**	.452**	.570**	1	.246
9. DTMQ	-.435**	-.439**	-.449**	-.195**	.346**	.137	.472**	.246	1

** $p < .01$ level

- Highest correlated subscore:
  - DDS Emotional Burden and DDS Regimen Distress (.740)
- Highest correlated subscore with DTMQ:
  - DDS Regimen Distress (.472)
- Highest correlated DSMQ and DDS subscores:
  - DSMQ Dietary Control and DDS Regimen Distress (-.456)

ANOVA Test
DSMQ vs Employment Status

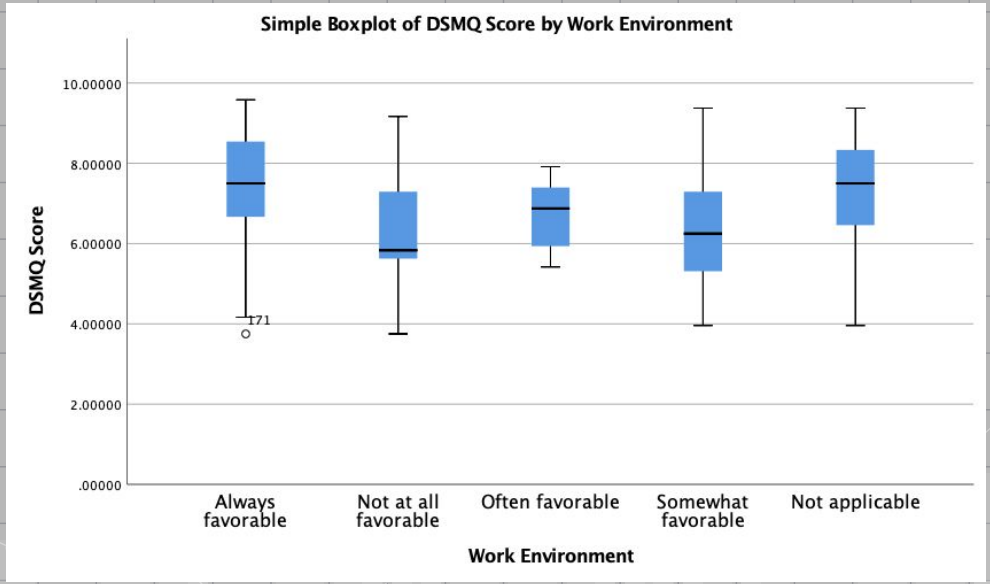


ANOVA

DSMQ Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.775	4	8.194	4.477	.002
Within Groups	334.952	183	1.830		
Total	367.726	187			

ANOVA Test
DSMQ vs Work Environment

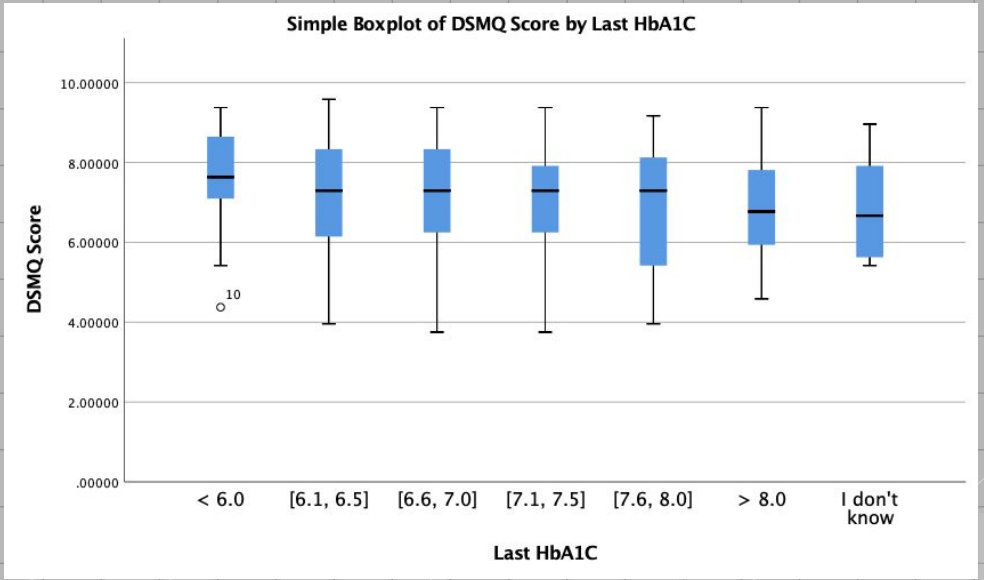


ANOVA

DSMQ Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.944	4	5.986	3.186	.015
Within Groups	343.782	183	1.879		
Total	367.726	187			

ANOVA Test
DSMQ vs Last HbA1C



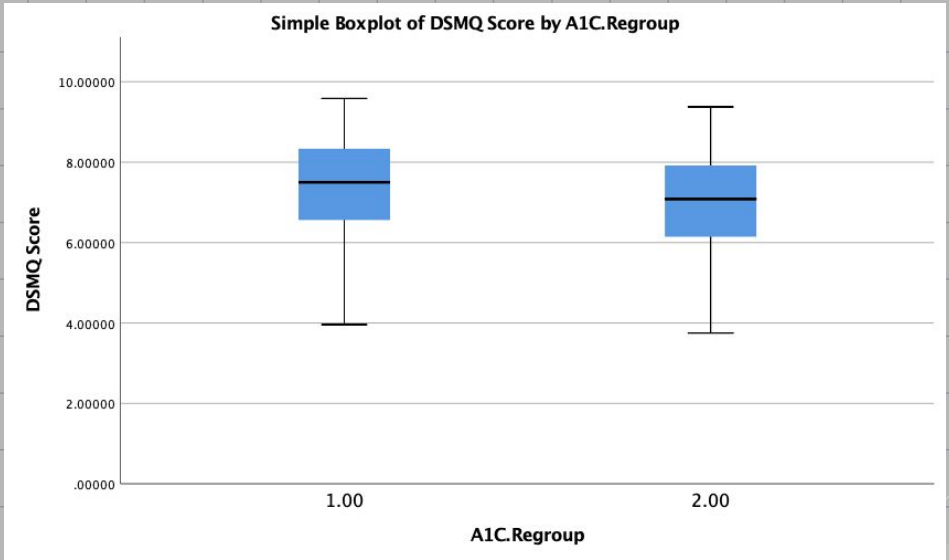
ANOVA

DSMQ Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.500	6	2.083	1.062	.387
Within Groups	355.227	181	1.963		
Total	367.726	187			

*HbA1C: Hemoglobin A1C

ANOVA Test - After Regrouping
DSMQ vs Last HbA1C



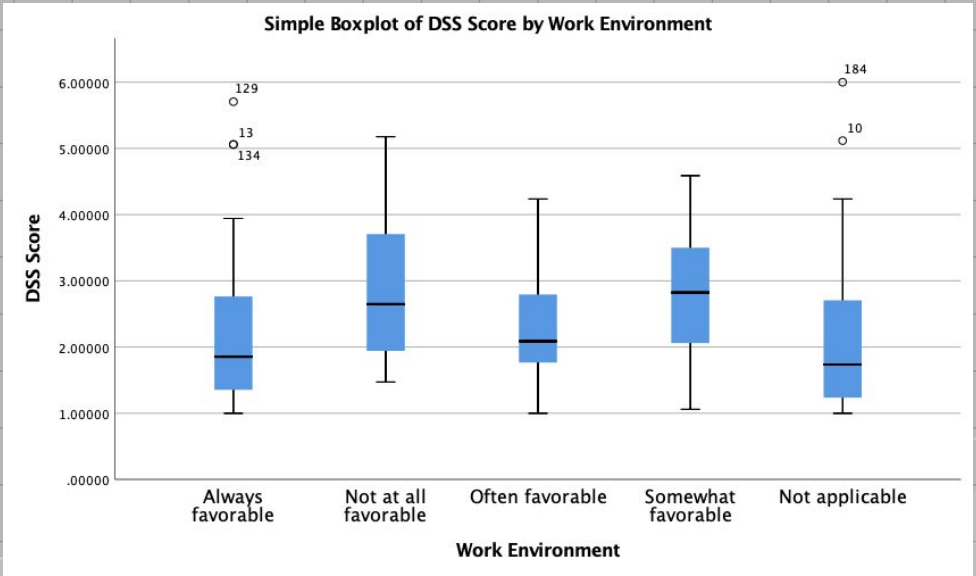
ANOVA

DSMQ Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.556	1	7.556	3.902	.050
Within Groups	360.170	186	1.936		
Total	367.726	187			

**Regrouped by:
- 1 = 6.5 and less
- 2 = 6.6 and above

ANOVA Test
DDS vs Work Environment

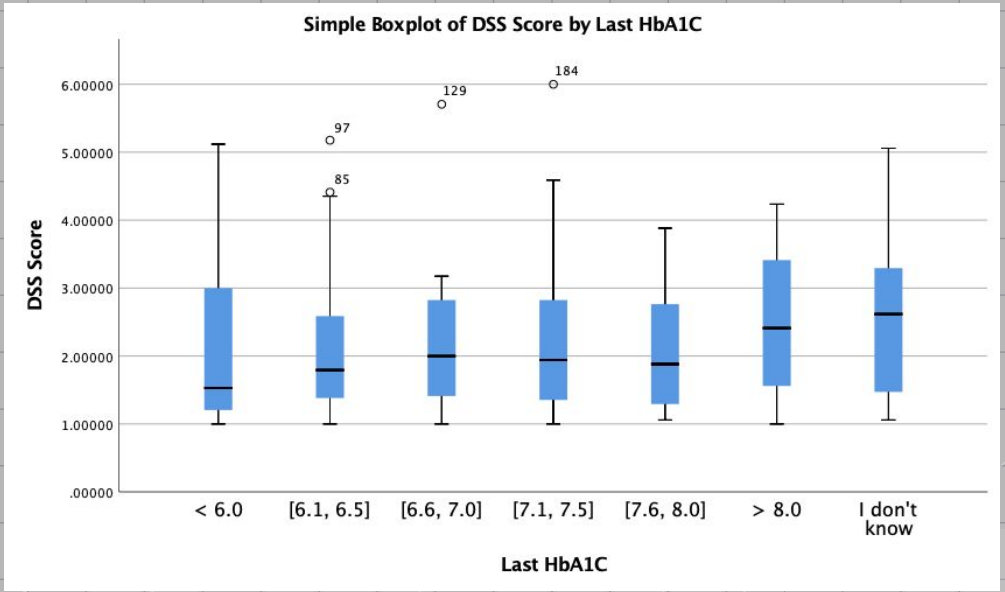


ANOVA

DSS Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.472	4	3.618	3.413	.010
Within Groups	194.001	183	1.060		
Total	208.474	187			

ANOVA Test
DDS vs HbA1C

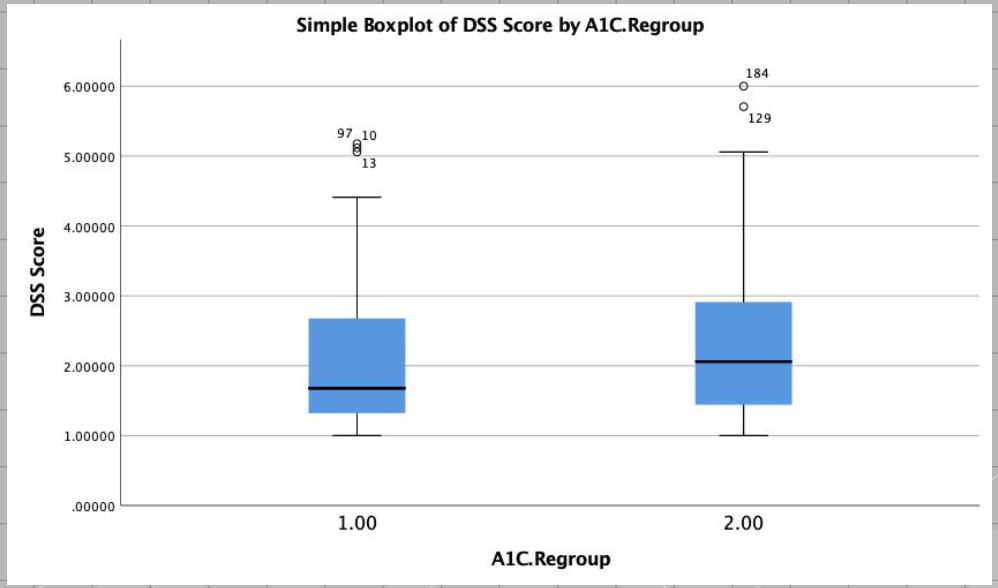


ANOVA

DSS Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.027	6	.671	.594	.735
Within Groups	204.447	181	1.130		
Total	208.474	187			

ANOVA Test - After Regrouping
DDS vs HbA1C



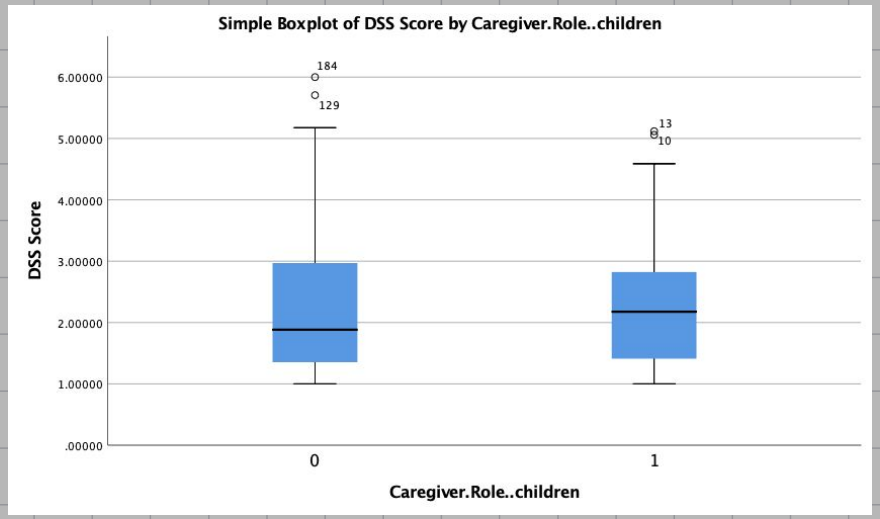
ANOVA

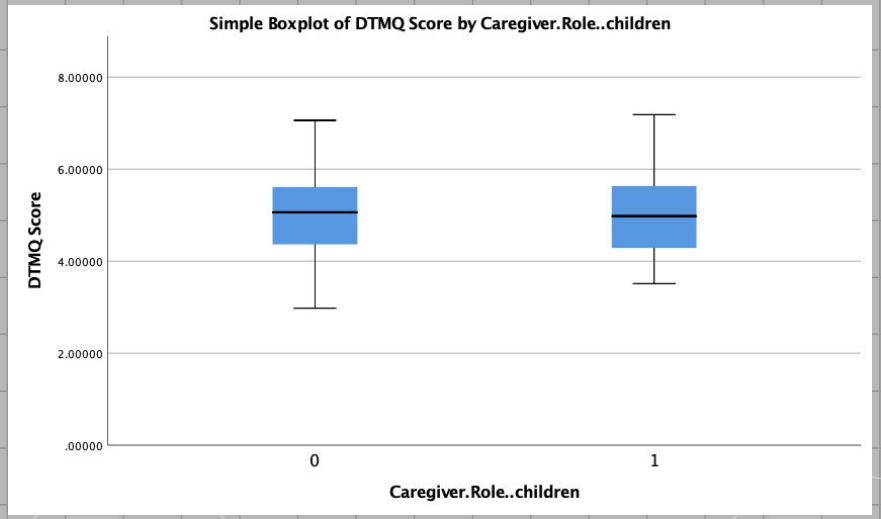
DSS Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.851	1	1.851	1.666	.198
Within Groups	206.623	186	1.111		
Total	208.474	187			

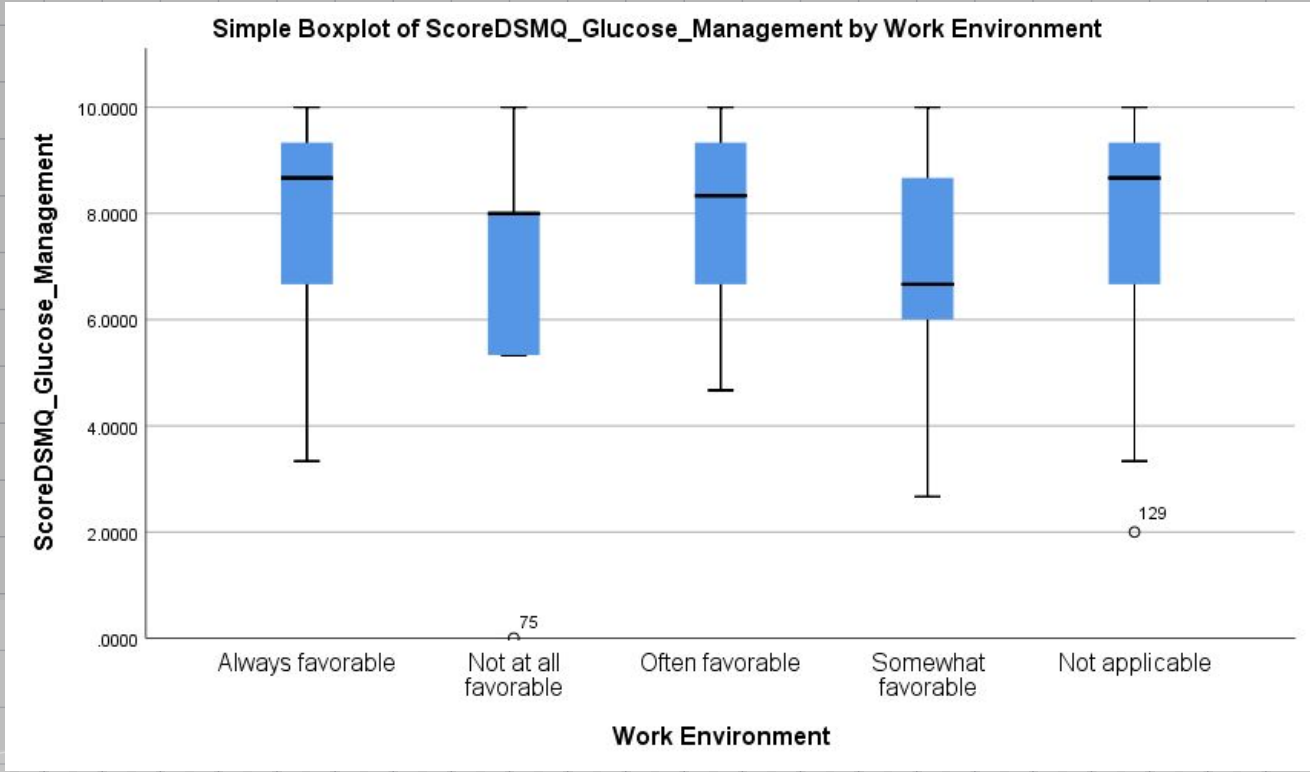
**Regrouped by:
1 = 6.5 and less
2 = 6.6 and above

ANOVA Test
DDS and DTMQ both with Children Caregiver Role

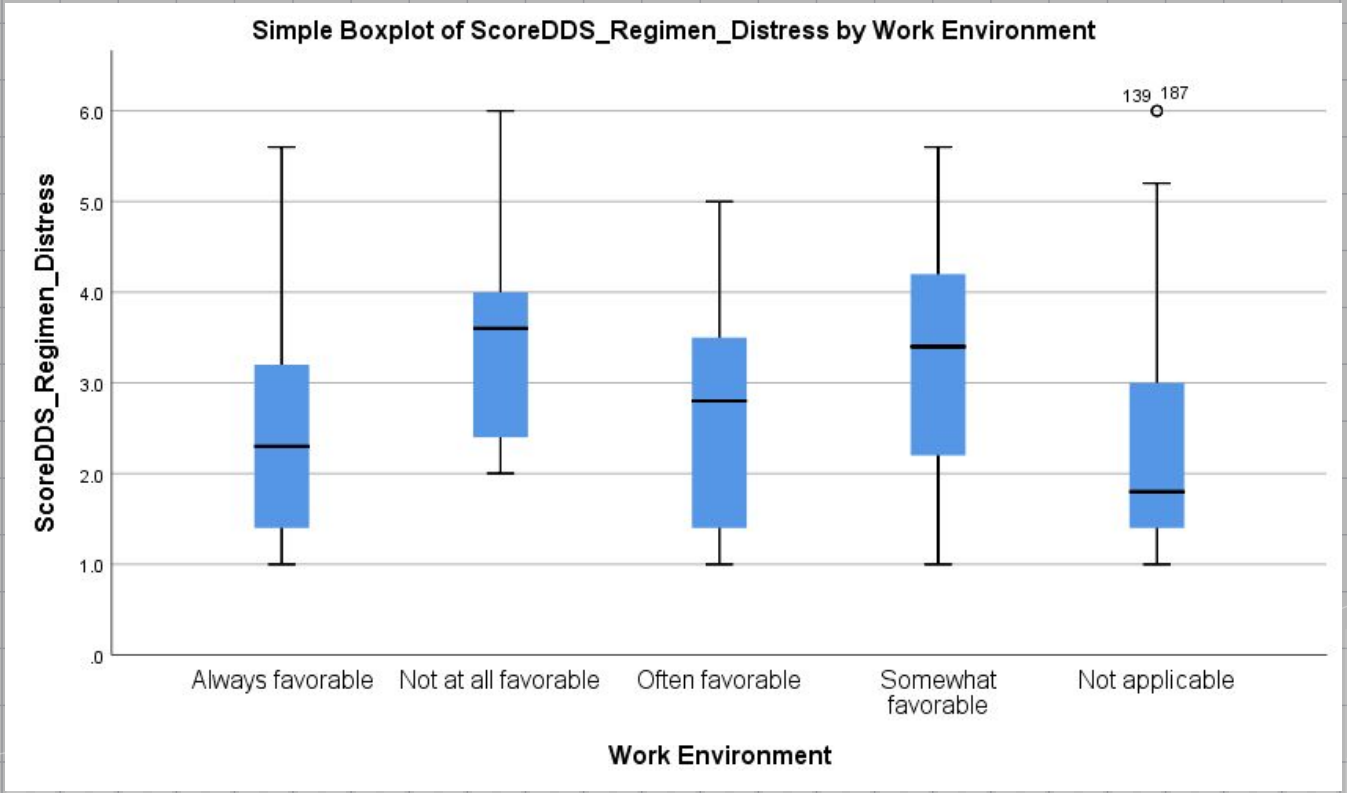




MANOVA Test
Glucose Management vs. Work Environment



MANOVA Test
Regimen Distress vs. Work Environment



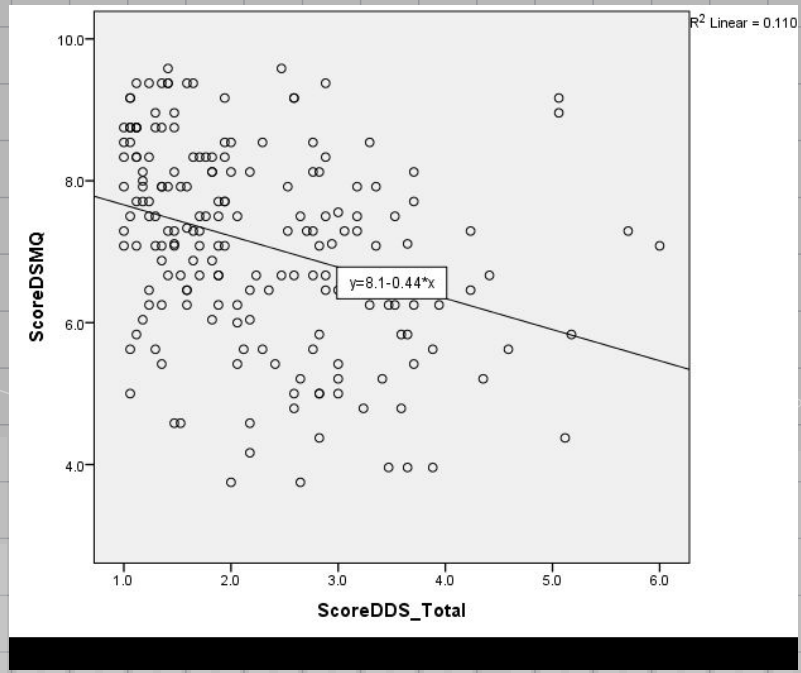
Data Modeling

Linear Regression - DSMQ vs DDS

Linear Regression Table

Coefficient	Unstandardized B	Coefficients Std. Error	t-value	Significance
Constant	8.1	0.228	35.514	0.000
Diabetes Distress Score	-0.44	0.092	-4.783	0.000

Linear Regression Graph

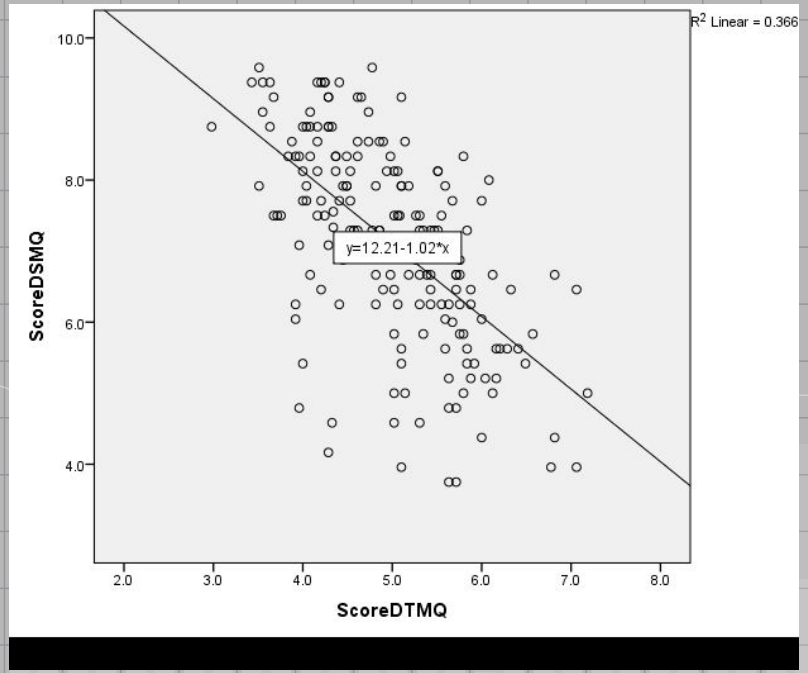


Linear Regression - DSMQ vs DTMQ

Linear Regression Table

Coefficient	Unstandardized B	Coefficients Std. Error	t-value	Significance
Constant	12.209	.498	24.505	.000
Diabetes Time Management Score	-1.022	.099	-10.370	.000

Linear Regression Graph

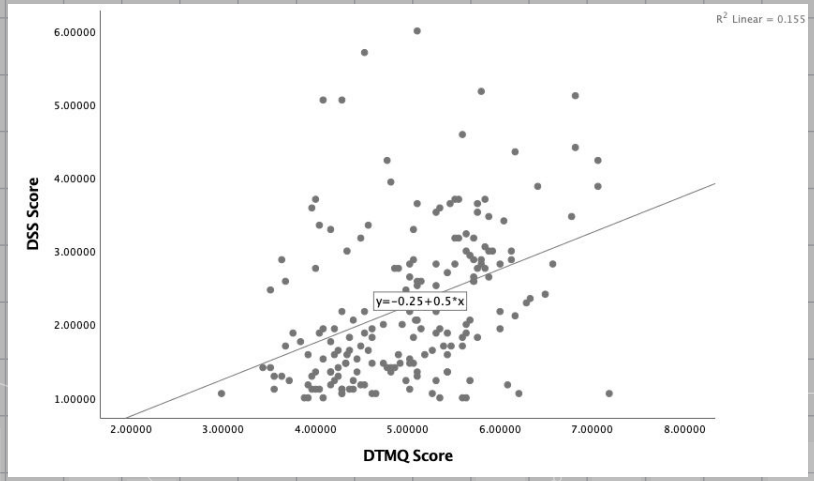


Linear Regression - DDS vs DTMQ

Linear Regression Table

Coefficient	Unstandardized B	Coefficients Std. Error	t-value	Significance
Constant	-.248	.433	-.573	.568
Diabetes Time Management Score	.500	.086	5.839	.000

Linear Regression Graph



Multiple Linear Regression Model

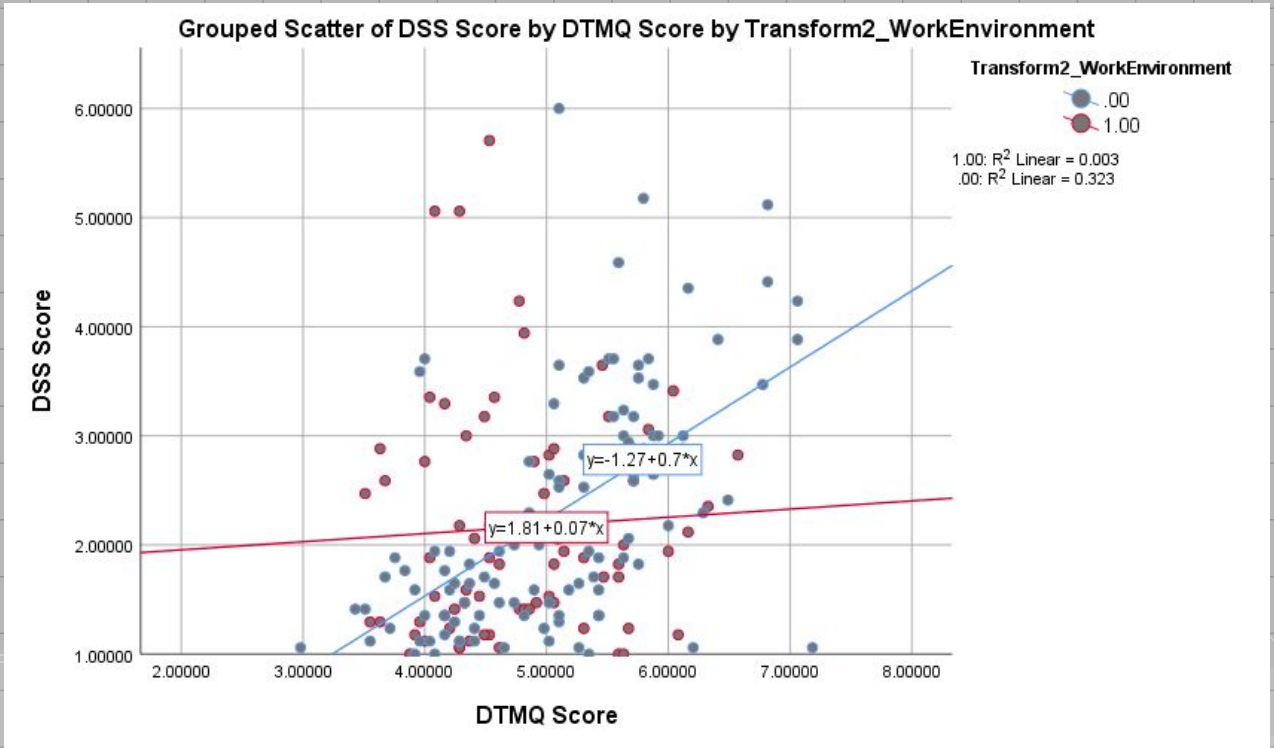
Significantly correlated

$$DSMQ = 8.507 - .525DDS + .413FullTimeEmployment*DDS - 1.717FullTimeEmployment$$

- Dependent Variable: DSMQ total score
- Independent Variable: DDS total score, Employment Status, interaction term

- When employed full time, DSMQ score is expected to decrease .112 points with every unit increase in the DDS score
- When not employed full time, the DSMQ score is expected to decrease .525 points with every unit increase in the DDS score

Multiple Linear Regression Model



- Dependent variable: DDS
- Independent variables: DTMQ, work environment, and interaction term
- Significant ($p < .05$) for work environment and the DTMQ score
- As time management score increases, the distress score increases at a greater rate of change for not favorable work environments vs. favorable work environments

Multiple Linear Regression Model

Significantly correlated subscores

$$Dietary\ Control\ = \\ \mathbf{8.318 - 1.063}RegimenDistress + \mathbf{.457}A1C{>}6.5 * RegimenDistress \mathbf{- 1.34}A1C{>}6.5$$

- Dependent Variable: Dietary Control (DSMQ Subscore)
- Independent Variables: Regimen Distress (DDS Subscore) , A1C, interaction terms
- When A1C was greater than 6.5, dietary control score is expected to decrease by .606 with every unit increase in the regimen distress score
- When A1C is below 6.5, Dietary control score is expected to decrease by 1.063 for every unit increase in the regimen distress score

Conclusion

Conclusion

- Overarching research question for this study:
  - What are the relationships between and among diabetes self care, diabetes time management, and diabetes distress in women with T2DM?

- Main variable results concluded:
  - Three main variables significantly correlated with each other
    - Greater distress and weaker time management skills lead to weaker self management skills
    - Greater distress resulted in weaker time management skills, and vice versa

Conclusion

- Demographic results concluded:
  - Employment Status:
    - Self management score will decrease more drastically when **not** employed full time compared to full time employment
  - Work Environment:
    - Distress will increase at a greater rate with less time management skills when working in a **not** favorable environment compared to other types of environments

Conclusion

- Thought-provoking demographic variables:
  - HbA1C:
    - Was not significant against any main variables which was not as expected
  - Children Caregiver Role:
    - Did not result in higher stress or less time management skills, but was expected to
    - This finding was probably because majority of women in this study were older in age as well as their children

Thank you,
any questions?