Measure of Facilitative Dispositional Autonomy (MFDA)

Version 0.3 – Spring Semester 2019

Some people like working alone and do it well. Let's find them.

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PSYC 6327 - Psychometrics

Contents

Introduction

This manual summarizes underlying intentions and practical application of the *Measure of Facilitative Dispositional Autonomy* (MFDA) scale version 0.3. The MFDA is a multi-construct scale aiming to measure facilitative dispositional autonomy (FDA). Initially hypothesized subfactors of FDA are (1) conscientiousness, (2) internal locus of control, and the key differentiating construct (3) dispositional autonomy. A high score on the finished MFDA will indicate ability to self-motivate and problem solve when given responsibility and little follow-up guidance. This iteration of the scale was created as an exercise, without reference to existing scales. Future versions could be much better contextualized and operationalized, utilizing re-evaluated hypotheses based on the results of this initial analysis and on the academic literature.

Intended application

MFDA aims to evaluate whether a worker will remain both productive and emotionally stable in an isolated job role. Constructs measured are hypothesized to relate to criteria reflected in productive work behaviors in roles involving little to no in-person interaction. Top-scoring respondents should exhibit more productivity working alone for longer periods of time compared with lower-scoring respondents.

The MFDA is intended to fit workers for the isolated type of job described from 1:20 to 2:50 in the Bloomberg Business Week video "Inside China's High Tech Dystopia," (Bloomberg, 2019).

Initial Hypothesized Constructs

Conscientiousness

First, MFDA seeks to measure Conscientiousness, a well-established construct that has a strong relationship with desirable work outcomes. Conscientiousness will ensure a high scorer is detail-oriented and meticulous, but also includes a preference for predictable behaviors, which matches well with the imagined work environment. Conscientiousness includes attention to detail and care, a drive to perform perfectly in tasks and to be reliable when assisting others. The trait also implies a goal-oriented, organized work style, with well-thought-out behaviors as opposed to spontaneity. Finally, conscientious people tend to conform to societal norms and expectations.

Internal Locus of Control

Internal locus of control indicates an ability to self-motivate. Rotter, 1966 defines locus of control as "the degree to which the individual perceives that the reward follows from, or is contingent upon, his own behavior or attributes versus the degree to which he feels the reward is controlled by forces outside of himself… independently of his own actions." The paper describes two personality types, with one tending to connect rewards more readily to their actions. The researchers label this group as having an "Internal locus of control," whereas the group less likely to attach rewards to their own actions are labeled as having "external locus of control." People in the "external" category prefer external, overt rewards for productive work behaviors, for example praise from a

manager. Because the types of workers the MFDA seeks to identify will need to self-regulate in realizing psychological rewards for work actions, it aims to identify individuals who exhibit "internal locus of control."

Dispositional Autonomy

Finally, dispositional autonomy indicates a person's preference for making self-driven decisions. Of note, researchers Xiao et al. have also developed and validated a Chinese-language scale to measure Dispositional Autonomy. The primary construct has recently been termed *dispositional autonomy* (Xiao, Wang, Chen, Zheng, & Chen, 2015). They reference an existing scale measuring *Autonomy* orientation (Deci & Ryan, 1985), and another exists (Weinstein, Przybylski, & Ryan, 2012). However *Autonomy* also sometimes refers to another construct referred to in academic feminist literature in the philosophy field (Stoljar, 2018). For that reason, and to operationalize this term as a trait rather than a state, I will use the term *dispositional autonomy* (DA).

DA manifests as a "high degree of experienced choice with respect to the initiation and regulation of one's own behavior" (Deci & Ryan, 1985). People who measure high on a DA scale tend to seek out a freedom to make choices autonomously and take initiative. I hypothesize that this trait will predict success in the work contexts of concern.

Psychometric development

Initial Items

Validation was conducted using an initial group of 28 survey items, with 3 hypothesized underlying constructs. Two scales were used, with 8 scored on a 5-point Likert scale measuring agreement, and 20 scored on a 5-point Likert-like scale *"Reflect me?" (Vagias 2006)*. See Appendix A for a full listing.

Norm group / sample

284 total surveys were administered. The subjects were largely undergraduate psychology students at East Carolina University. These students were given course credit for completing this survey. The assessment was also made available to about 1000 combined Facebook/LinkedIn contacts.

70 complete survey responses were removed during data cleaning due to an item coding mistake. 5 responses were removed because they shared missing data on a full hypothesized construct's item set. An additional 51 full responses were removed due to missing data in either item responses or demographics. Finally, 4 responses were removed because they took less than 4 minutes to complete the survey. A total of 154 total responses were utilized. Future MFDA iterations should consider utilizing a less aggressive data cleaning technique.

Reliability Analysis

A reliability analysis utilizing both Cronbach's Alpha showed that hypothesized factors had inadequate levels, all below .7. Dispositional autonomy items had a .36 alpha, conscientiousness items has a .47 alpha, and locus of control items had an alpha of .58. This indicates that the item groups were not split in a way that promoted internal consistency.

Cronbach's alpha for all items combined was adequate at .7, but the "alpha if item removed" readout showed improvement by eliminating items DA1, DA7, and CO8 (See Appendix 1). After removing these 3 items alpha value was 0.76 and Omega value was .81, indicating adequate internal consistency of the scale.

Final Constructs

Final Items

Upon conducting exploratory factor analysis, the group was reduced to a total of 12 items, with 3 underlying constructs. These include 6 scored on a 5-point Likert scale measuring agreement, and 6 scored on a 5-point Likert-like scale measuring self-perception. See Appendix A for a full listing. For future iterations of the MFDA, a standard Likert scale should be used for all items. Analysis of item groups resulting from factor analysis indicates that this the scale needs further development.

Exploratory factor analysis isolated 3 constructs:

Factor 1 – Independent conscientiousness

This construct manifests as self-efficacy, as expressed in the item "I know what's best for myself," and conscientiousness, as measured by "Knowing a job is done right helps me sleep better."

Factor 2 – Dispositional autonomy

This construct manifests as self-efficacy, as expressed in the item "If I work hard, I can reach any goal I set," and lateral thinking ability, as measured by "I feel great when I find a way to complete a task more quickly than I could before."

Factor 3 – Rule-oriented opportunism

This construct manifests as competitiveness, as expressed in the item "For me to feel like I won, someone else must also lose.," conservative decision making, as measured by "Rules are rules, and if I don't like them I'll need to change them the right way." It also includes a seemingly contradictory item, "I get better results asking for forgiveness after doing something rather than asking permission beforehand."

See Item Analysis section for full item lists and grouping patterns.

Exploratory factor analysis

Table 1: Eigenvalues

Item Number	Eigenvalue
DA2	4.07
DA3	1.35
DA4	1.06
DA5	0.81
DA6	0.55
DA8	0.36
DA9	0.32
DA10	0.16
CO1	0.13
CO2	0.09
CO3	0.03
CO4	-0.11
CO5	-0.17
CO6	-0.19
CO7	-0.24
CO9	-0.27
CO10	-0.30
LC1	-0.32
LC2	-0.37
LC3	-0.39
LC4	-0.42
LC5	-0.47
LC6	-0.51
LC7	-0.52
LC8	-0.57

VSS complexity 1 achieves a maximum of 0.5 with 2 factors. VSS complexity 2 achieves a maximum of 0.58 with 3 factors. The Velicer MAP achieves a minimum of 0.02 with 3 factors. Based on consensus of Kaiser criterion, VSS, and MAP, followed by factor analysis and evaluation of coherence of resulting factors, the MFDA 0.2 isolates 3 factors from the dataset.

Table 2: Evaluation of factor quantity

Evaluation Technique	# of Factors
Kaiser criterion	3
Scree plot visual analysis	1
Parallel Analysis	5
Very simple structure Complexity 1 and 2	2 and 3
Velicer MAP	3

Item Analysis

Table 3: Factor Loadings

Item	Factor 1	Factor 2	Factor 3
CO10	.60		
CO4	.58		
DA8	.52		
DA10	.51		
CO1			
DA2			
CO3			
CO2			
DA6			
DA9			
DA5			
DA4			
LC8		.79	
LC4		.69	
LC1		.62	
LC3		.54	
LC7		.51	
LC6			
LC5			.58
CO7			.51
CO9			.51
CO6			
LC2			
DA3			
CO5			

3-factor pattern matrix utilizing oblmin oblique rotation indicated 3 usable constructs. All survey items darkened in *Table 3* above failed to exhibit loading values above .5.

Intercorrelation between factors

Item	Factor 1	Factor 2	Factor 3
Factor 1	1.0	.38	.14
Factor 2	.38	1.0	.01
Factor 3	.14	.01	1.0

Table 4: Factor 1 items

Please indicate how true of you each statement is:
DA8: I know that I can solve any problem I put my mind to.
DA10: I know what's best for myself.
CO4: Knowing a job is done right helps me sleep better.
CO10: Getting the job done for the good of the company makes me feel like I'm valuable.

Overall distribution of aggregate scores in the sample was positively skewed.

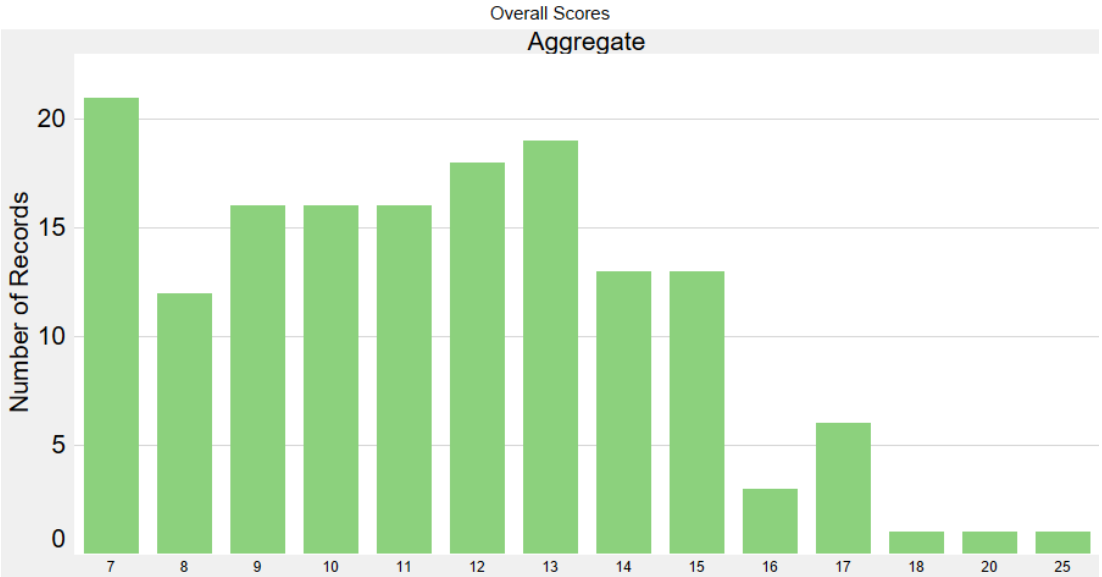
Table 5: Factor 2 items

Please indicate the degree to which you agree with the following statements:
LC1: If I work hard, I can reach any goal I set.
LC3: If I don't know the answer to a question, I can usually find it.
LC4: I feel great when I find a way to complete a task more quickly than I could before.
LC7: I give excellent advice.
LC8: I often laugh at my own jokes.

Table 6: Factor 3 items

Please indicate how true of you each statement is:
CO7: I get better results asking for forgiveness after doing something rather than asking permission beforehand.
CO9: Rules are rules, and if I don't like them I'll need to change them the right way.
Please indicate the degree to which you agree with the following statements:
LC5: For me to feel like I won, someone else must also lose.

Table 7: Aggregate Score Distribution



Group Differences

Table 8: Group differences on Factor 1 score measured by Welch's t-tests

Group	p-value
Sex: Female VS Male	0.37
Race: White VS African American	0.15
Age: 18-24 VS 25-34	Not Enough Data

Table 9: Group differences on Factor 2 score measured by Welch's t-tests

Group	p-value
Sex: Female VS Male	0.38
Race: White VS African American	0.12
Age: 18-24 VS 25-34	Not Enough Data

Table 10: Group differences on Factor 3 score measured by Welch's t-tests

Group	p-value
Sex: Female VS Male	0.26
Race: White VS African American	0.11
Age: 18-24 VS 25-34	Not Enough Data

Table 11: Group differences on aggregate score measured by Welch's t-tests

Group	p-value
Sex: Female VS Male	0.51
Race: White VS African American	0.19
Age: 18-24 VS 25-34	Not Enough Data

No significant group differences found for any factor, or for the aggregate scores. For visualizations, see Appendices B and C.

Test Administration

General Guidelines

Because the sample taken for scale development was an internet survey, this assessment should be administered on the internet. Application in other contexts may be useful, but also might introduce unforeseen error due to unexpected variation. While the sample for this validation included a significant portion who were undergraduate students, it also included a substantial number of test-takers who were not students. This was a convenience sample, and no evaluation was undertaken of whether the sample taking the test is representative of the general population.

An aggregate score can be calculated as follows:

Table 12: Calculating scores

Factor 1 score	DA8 + DA10 + CO4 + CO10
Factor 2 score	LC8 + LC4 + LC1 + LC3 + LC7
Factor 3 score	LC5 + CO7 + CO9
Aggregate score	Factor 1 + Factor 2 – Factor 3

Score Interpretation

When calculated as specified above, the highest possible total score is preferred.

Limitations

Scale publication mistake

The initial publication of the survey had an error in the scale. Fixing it caused a loss of 75 cases. Thankfully, the survey was widely distributed enough to achieve a usable sample. Having developed skills in Qualtrics, this type of problem will be easy to avoid in future iterations.

Missing data

As a solution for missing examples in the dataset, all examples with any missing data were removed. While this allowed analysis to move forward in a timely manner, it is possible that it contributed systematic error. Future iterations should use dummy variables to investigate patterns in missing data. As well, researchers are wise to consider utilizing a proxy variable or multiple imputation.

Self-imposed item development limitation

Items were developed with little outside influence as an exercise in scale validation. Future iterations will include a literature review to align hypothesized constructs with operational definitions established in self-determination theory literature and research into self-efficacy. As well, more literate alignment with existing definitions of constructs not mentioned will be possible.

The resulting constructs include items that are relevant to self-efficacy, conscientiousness and dispositional autonomy as intended. However, to be more useful as selection tools, future iterations should include items should be included that measure intrinsic motivation. Furthermore, all constructs need more valid and reliable items of high quality.

Likert scale to be used in future iterations

In attempting to use a variety of techniques, both Likert and a Likert-like scale were used in constructing items. In retrospect, this complicated the analysis unnecessarily. Future iterations will use only a Likert scale.

Factor 3 Considerations

Factor 3 appears internally contradictory, but it stood up to tests of internal consistency. For this iteration, because the questions isolated appear to run counter to the intended goal of group-success orientation and lateral thinking, this construct was used as reverse-scored. Investigation and research are warranted.

Time / iteration limitation

Producing this version of the scale, some items that map to useful constructs have been identified. However, version 0.3 of the scale does not reach the goal of the Measure of Facilitative Dispositional Autonomy (MFDA). Creating a scale that is useful for application will require numerous iterations and further validation efforts.

Appendix A:
Listing of Evaluated items

Items designed to measure conscientiousness

All items measuring this construct use the rating scale *"Reflect me?" (Vagias 2006).*

1 – Very untrue of me, 2 – Untrue of me, 3 – Neutral, 4 – True of me, 5 – Very true of me

1. I do dishes right away after I finish eating.
2. My taxes are always turned in early.
3. If the police ever pulled me over, I would know exactly where all the documents they want to see are.
4. Knowing a job is done right helps me sleep better.
5. It's ok if one part of the job isn't quite right, if the rest of the steps are finished. (reverse scored)
6. Even if there's an old way to something, I can often find a better way the first time. (reverse scored)
7. I get better results asking for forgiveness after doing something rather than asking permission beforehand. (reverse scored)
8. Sometimes I don't have time to get everything done I'm supposed to. (reverse scored)
9. Rules are rules, and if I don't like them I'll need to change them the right way.
10. Getting the job done for the good of the company makes me feel like I'm valuable.

Items designed to measure locus of control

All items measuring this construct use the rating scale *"Level of Agreement" (Vagias 2006).*

1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree

1 If I work hard, I can reach any goal I set.

1. Trophies and titles at work are very valuable to me. (reverse scored)
2. If I don't know the answer to a question, I can usually find it.
3. I feel great when I find a way to complete a task more quickly than I could before.
4. For me to feel like I won, someone else must also lose. (reverse scored)
5. Most bosses are in that role because they know the best way to do the job of the people they are managing. (reverse scored)
6. I give excellent advice.
7. I often laugh at my own jokes.

Items designed to measure dispositional autonomy

All items measuring this construct use the rating scale *"Reflect me?" (Vagias 2006).*

1 – Very untrue of me, 2 – Untrue of me, 3 – Neutral, 4 – True of me, 5 – Very true of me

1. When I think of memories of moments when I was alone, I feel mostly negative emotions. (reverse scored)
2. When I'm alone, I usually get all my work done.
3. I get more done working on a team rather than working alone. (reverse scored)
4. In a public place, I would get more work done with headphones on so that I'm not distracted.
5. I'd be more content working in my own office rather than having a desk in an open plan office.
6. When I finish a hard job, I feel great about myself.
7. I'd rather read a book than go to a party.
8. I know that I can solve any problem I put my mind to.
9. It's easier to make the right decision when everyone discusses the options. (reverse scored)
10. I know what's best for myself.

Appendix B:
Sample Demographics

Table 13: Race

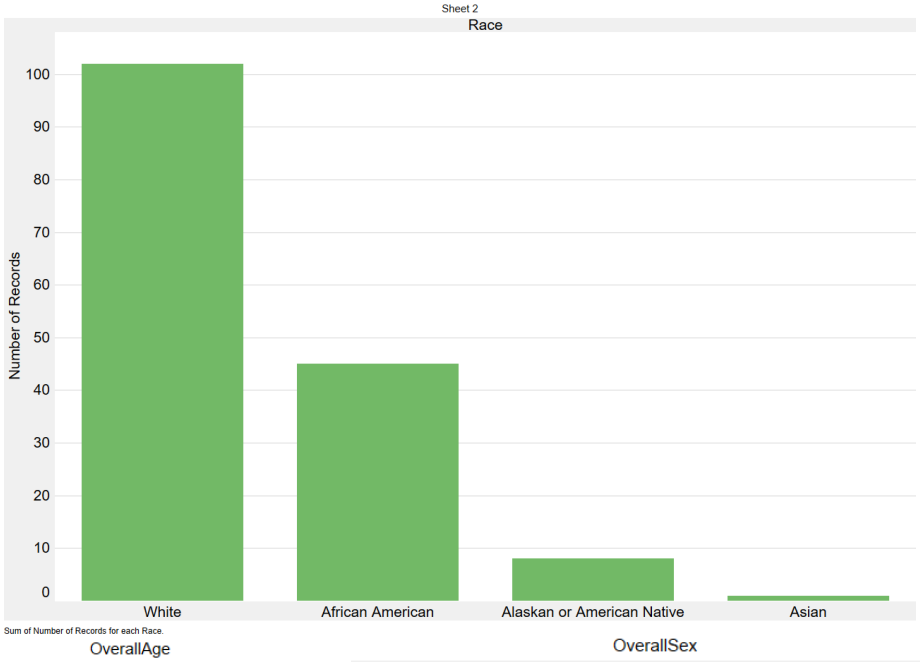


Table 14: Age

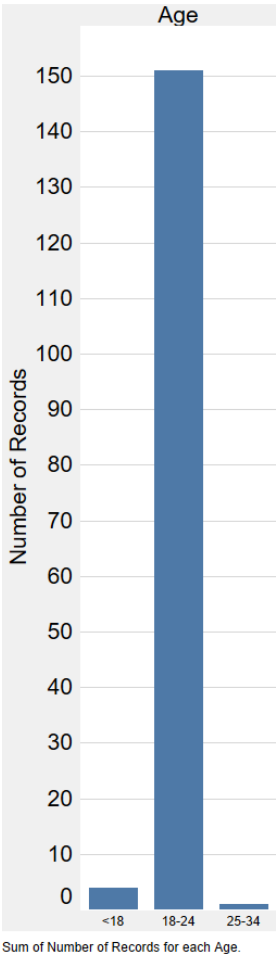
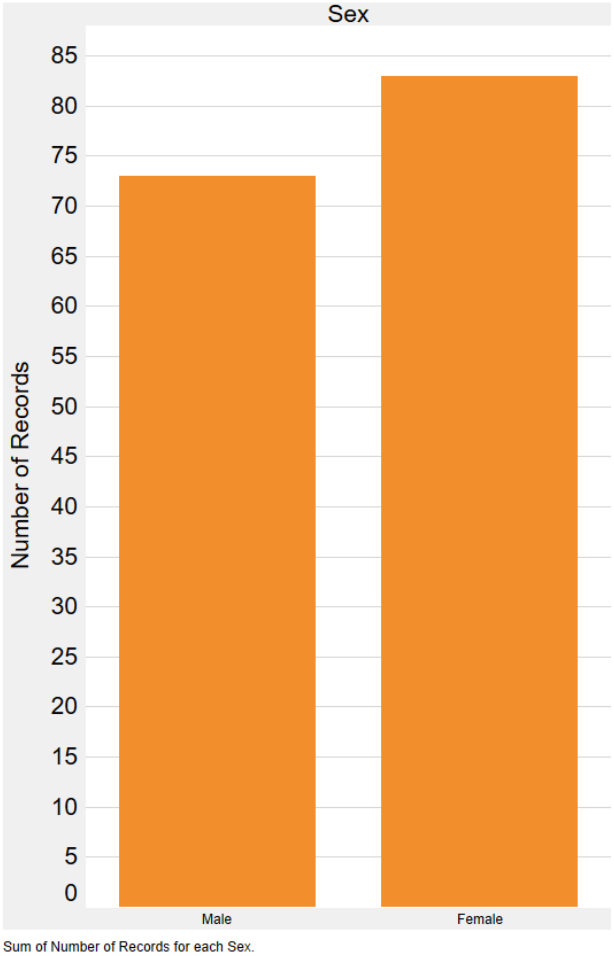


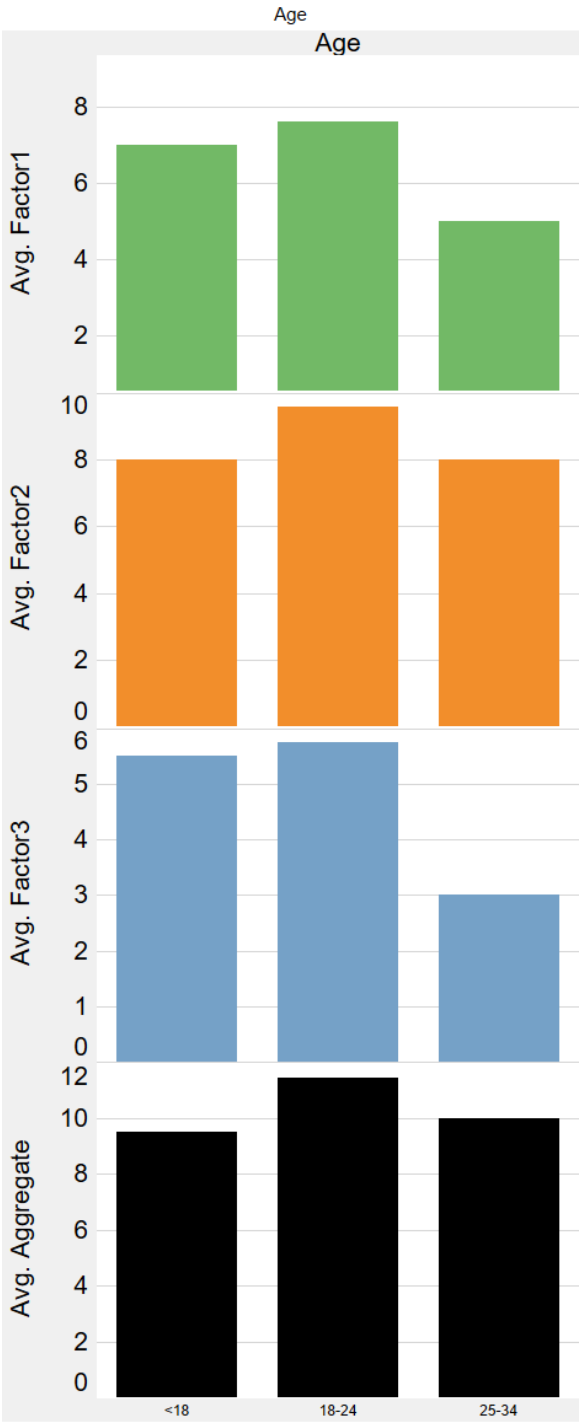
Table 15: Sex



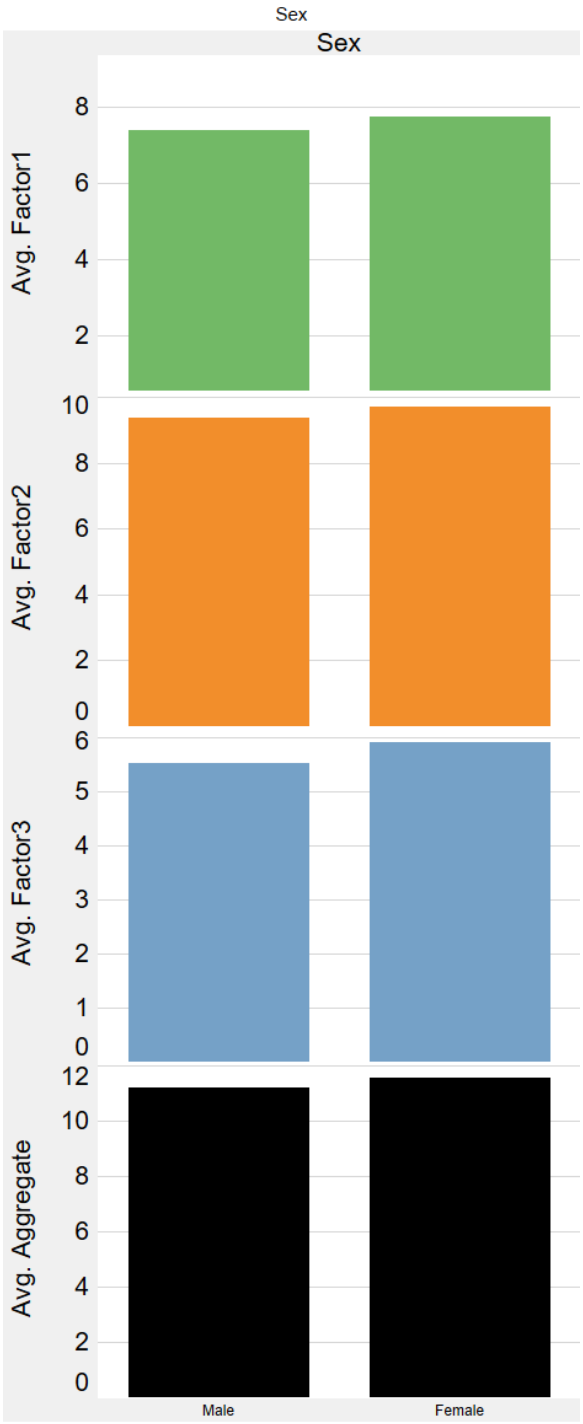
Appendix C:
Factors by age, sex, and race

Table 16: Measures by Age

Table 17: Measures by Sex

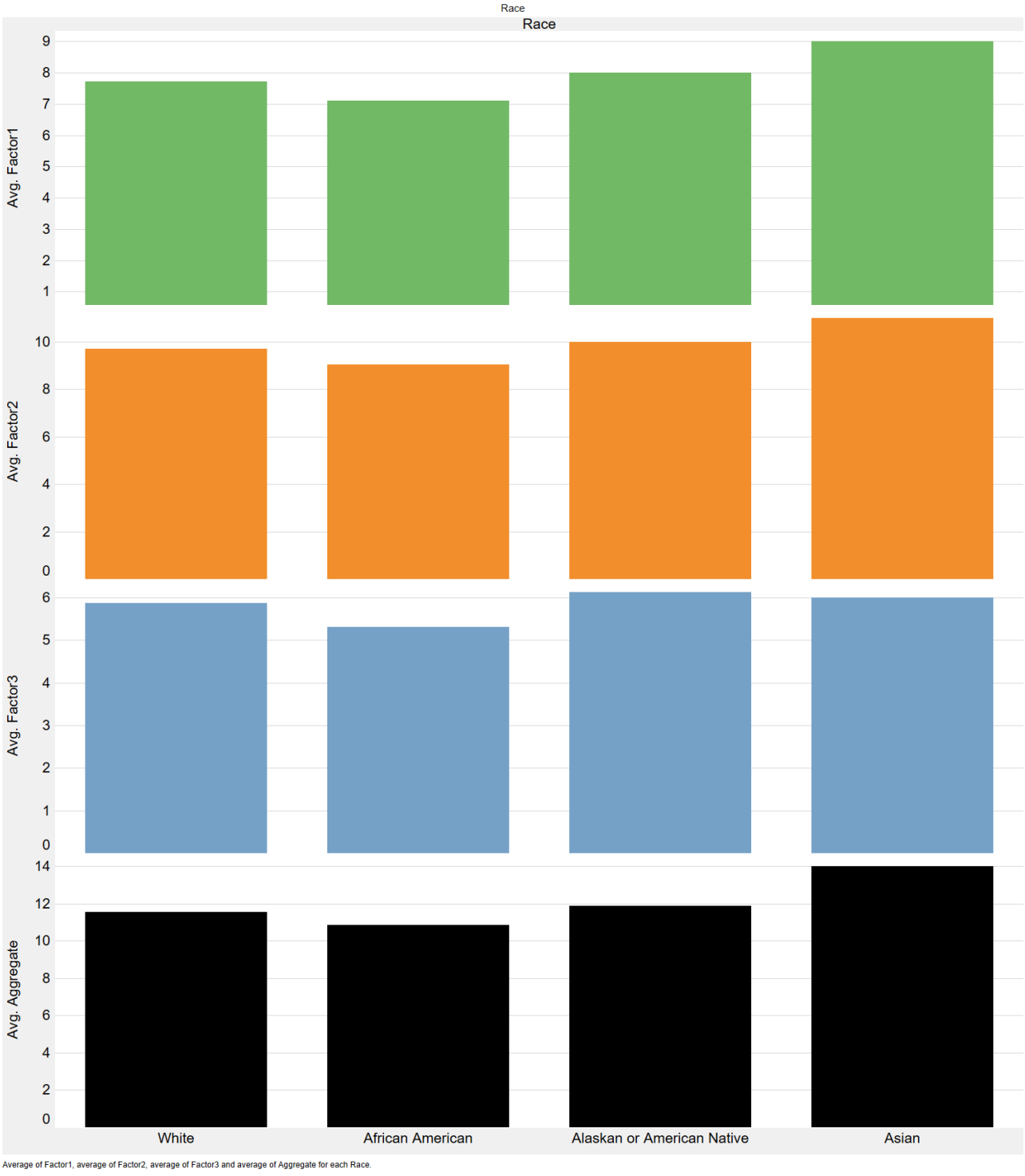


Average of Factor1, average of Factor2, average of Factor3 and average of Aggregate for each Age.



Average of Factor1, average of Factor2, average of Factor3 and average of Aggregate for each Sex.

Table 18: Measures by Race



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