**Online Supplementary Materials**

**Part A. Questionnaire items**

**Grit Scale (**[**English version**](https://angeladuckworth.com/research/)**)**

Translated from Duckworth and Quinn (2009)

8 items: *Perseverance of Effort*: 1, 2, 3, 4; *Consistency of interest*: 5, 6, 7, 8.

|  |
| --- |
| **Persian items** |
| **تداوم تلاش**  |
| 1-هر کاری را که شروع کنم، تمام می کنم. |
| 2-شکست من را دلسرد نمی کند. |
| 3-آدم با پشت کاری هستم. |
| 4-آدم سخت کوشی هستم. |
| **ثبات علاقه**  |
| 5-اغلب برای خودم هدفی تعیین می کنم اما بعدا تصمیم میگیرم به دنبال هدف دیگری بروم.\* |
| 6-تا به حال برای مدت کوتاهی ذهنم مشغول ایده ی بخصوصی شده است، اما بعدا علاقه ام به آن از بین رفته است.\* |
| 7-در حفظ تمرکزم بر روی کارهایی که اتمامشان بیشتر از چند ماه طول می کشد مشکل دارم.\* |
| 8-ایده ها و کارهای جدید حواسم را از کارهای قبلی پرت می کند.\* |

**Language Mindset Inventory**

Translated from Lou and Noels (2017)

|  |  |
| --- | --- |
| ***English items*** | **Persian items** |
| ***Fixed language mindset*** | **ذهنیت زبانی ثابت**  |
| 1- You have a certain amount of language intelligence, and you can’t really do much to change it. | 1.شما ظرفیت هوش زبانی مشخصی دارید، و نمیتوانید کاری کنید تا آن را تغییر دهید. |
| 2- Your language intelligence is something about you that you can’t change very much. | 2.هوش زبانی شما چیزی در مورد شماست که نمیتوانید آن را زیاد تغییر دهید. |
| 3- To be honest, you can’t really change your language intelligence. | 3.شما واقعا نمیتوانید هوش زبانی تان را تغییر دهید. |
| 4- To a large extent, a person’s biological factors (e.g., brain structures) determine his or her abilities to learn new languages.**×** | 4.به میزان زیادی، عوامل زیستی (مانند ساختار مغز) توانایی فرد برای یادگیری زبان های جدید را مشخص می کند. **×** |
| 5- It is difficult to change how good you are at foreign languages. | 5.تغییر میزان تسلط شما بر زبان های خارجی سخت است. |
| 6- Many people will never do well in foreign languages even if they try hard because they lack natural language intelligence.**×** | 6.خیلی از افراد نمیتوانند زبان خارجی را خوب یاد بگیرند حتی اگر سخت تلاش کنند، زیرا هوش زبانی ندارند. **×** |
| 7- How well a person speaks a foreign language depends on how early in life he/she learned it. | 7.توانایی صحبت کردن به زبان خارجی بستگی به این دارد که فرد یادگیری را از سنین پایین شروع کرده باشد.  |
| 8- People can’t really learn a new language well after they reach adulthood. | 8.افراد وقتی به بزرگسالی می رسند، نمیتوانند زبان جدیدی را یاد بگیرند. |
| 9- Even if you try, the skill level you achieve in a foreign language will advance very little if you learn it when you are an adult. | 9.اگر در بزرگسالی زبان خارجی را یاد بگیرید، هرچقدر هم که تلاش کنید، پیشرفت شما در یادگیری زبان خارجی ناچیزی خواهد بود. |
| ***Growth language mindset***  | **ذهنیت زبانی رشد** |
| 10- No matter who you are, you can significantly change your language intelligence level. | 10.مهم نیست چه کسی هستید، میتوانید به طور چشمگیری سطح هوش زبانی تان را تغییر دهید. |
| 11- You can always substantially change your language intelligence. | 11.همیشه می توانید هوش زبانی تان را تاحد زیادی تغییر دهید. |
| 12- No matter how much language intelligence you have, you can always change it quite a bit. **×** | 12.مهم نیست چقدر هوش زبانی دارد، همیشه میتوانید آن را به میزان کمی تغییر دهید. **×** |
| 13- You can always change your foreign language ability. | 13.همیشه میتوانید توانایی زبان خارجی تان را تغییر دهید. |
| 14- In learning a foreign language, if you work hard at it, you will always get better. | 14.در یادگیری یک زبان خارجی، اگر سخت تلاش کنید، همیشه بهتر می شوید. |
| 15- How good you are at using a foreign language will always improve if you really work at it. | 15.اگر سخت تلاش کنید تسلط شما در استفاده از زبان خارجی همیشه بهتر می شود. |
| 16- Everyone could do well in foreign language if they try hard, whether they are young or old. | 16.هر کسی چه جوان و چه پیر اگر سخت تلاش کند، میتواند زبان خارجی را بخوبی یاد بگیرد. |
| 17- How well a person learns a foreign language does not depend on age; anyone who works hard can be a fluent speaker in that language. | 17.میزان تسلط فرد بر زبان خارجی وابسته به سن نیست؛ هر کسی که سخت تلاش کند می تواند آن زبان را روان صحبت کند. |
| 18- Regardless of the age at which they start, people can learn another language well. | 18.صرف نظر از سن شروع یادگیری زبان، افراد می توانند زبانی دیگر را به خوبی یاد بگیرند. |

**Note.** \* = items were reverse-coded

**×**=removed due to very low factor loadings.

**Part B. Assumptions for statistical analyses**

Before conducting our main analyses, assumptions of the statistical analyses were taken into account. Missing data, outliers, and normality were checked. Missing data were handled using full information maximum likelihood (FIML). This approach analyzes the parameters and standard errors based on both complete and incomplete responses. Moreover, FIML provides unbiased standard errors for high rates of missing data (e.g., more than 50%) and even when assumptions of missing at random are violated (see Arens & Morin, 2016). The rate of missing data was 3.7% for consistency of interest (valid cases = 1,140), 2.6% for perseverance of effort (valid cases = 1,148), and 5.4% for total grit items (valid cases = 1,115). The rate of missing data was 10.1% for fixed mindset (valid cases = 1,060), 9.6% for growth mindset (valid cases = 1,066), and 12.3% for total language mindset items (valid cases = 1,033). Finally, missing rate was 62.5% for L2 achievement (valid cases = 442). Both univariate and multivariate outliers were checked using Z-standardized and Mahalanobis D2, respectively. As a result, five cases of univariate outliers were detected for fixed mindset (final valid cases = 1,055) and three cases for growth mindset (final valid cases = 1,063) which were subsequently removed from the data. This made 1,025 final valid cases for language mindset. No multivariate outliers were detected in the data. For univariate normality, all skewness and kurtosis values were within the range of -1.5 and +1.5, assuring the normal distribution of the data. However, multivariate normality was not established using Mardia’s test. To control this lack of multivariate normality, we used robust multivariate normality (MLR) estimator.

For independent-samples t-test, we checked homogeneity of variances using Levene's test and based on this test appropriate *t* value and degrees of freedom were chosen. In addition, as we aimed to compare males and females with regard to their grit and language mindset, we had to be sure that males and females interpret the items in a similar way. For this reason, we used measurement invariance testing which is required for examining cross-group differences, here, gender differences (Chen, 2007; Van de Schoot, Lugtig, & Hox, 2012). To test measurement invariance, a stepwise procedure is used in which configural, metric, and scalar invariance are tested (Chen, 2007; Van de Schoot, Lugtig, & Hox, 2012). Configural invariance shows that the same number of items and factors are tenable across groups. Metric variance indicates equal factor loadings across groups. Finally, scalar invariance refers to equal item intercepts across groups. We tested measurement invariance based on Chen’s (2007) guidelines for adequate sample size (N > 300). Configural invariance is examined based on goodness-of-fit indices. goodness-of-fit indices are acceptable when comparative fit index (CFI) ≥ .90, and root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) ≤ .08 (Hu & Bentler, 1998; Marsh, Hau, & Wen, 2004). Metric invariance is supported when ΔCFI ≤ 0.010 supplemented by ΔRMSEA ≤ 0.015, or ΔSRMR ≤ 0.030. Finally, scalar invariance is held when ΔCFI ≤ 0.010 supplemented by ΔRMSEA ≤ 0.015, or ΔSRMR ≤ 0.010.

Table 1

*Results of Measurement Invariance Test for Grit and Language Mindset*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | χ2 | df | CFI | RMSEA | SRMR | ∆CFI | ∆RMSEA | ∆SRMR |
| **Grit** |  |  |  |  |  |  |  |  |
| Configural  | 92.47 | 38 | .958 | .050 | .040 |  |  |  |
| Metric  | 98.79 | 44 | .958 | .046 | .045 | .000 | .004 | .005 |
| Scalar  | 135.61 | 50 | .934 | .054 | .049 | .024 | .008 | .004 |
| **Language mindset** |  |  |  |  |  |  |  |  |
| Configural  | 640.12 | 164 | .903 | .071 | .089 |  |  |  |
| Metric  | 647.84 | 177 | .904 | .068 | .091 | .001 | .003 | .002 |
| Scalar  | 682.48 | 190 | .900 | .067 | .092 | .004 | .001 | .001 |

As Table 1 indicates, configural invariance was supported for both grit and language mindset implying that the same number of items and factors hold across groups. Metric invariance was supported for both grit and language mindset suggesting equal factor loadings across two groups. Finally, scalar invariance was supported for language mindset and partially supported for grit (∆CFI was higher than .010, but ∆RMSEA and ∆SRMR were acceptable). Given the results of the measurement invariance testing, we can state that males and females had the same perceptions of the items and underlying latent factors.

Corrected item-total correlations for grit and language mindsets can be seen in Table 2 and 3, respectively.

Table 2

*Corrected Item-Total Correlations for Grit Items*

|  |  |  |  |
| --- | --- | --- | --- |
| Consistency of interest | Corrected item-total correlation | Perseverance of effort | Corrected item-total correlation |
| GI1 | .304 | GP2 | .297 |
| GI3 | .291 | GP4 | .585 |
| GI5 | .443 | GP7 | .507 |
| GI6 | .372 | GP8 | .638 |

Table 3

*Corrected Item-Total Correlations for Language Mindset Items*

|  |  |  |  |
| --- | --- | --- | --- |
| Growth mindset | Corrected item-total correlation | Fixed mindset | Corrected item-total correlation |
| INC4 | .602 | LM1 | .545 |
| INC5 | .626 | LM2 | .608 |
| INC10 | .632 | LM3 | .586 |
| INC11 | .695 | LM8 | .392 |
| INC12 | .683 | LM9 | .456 |
| INC16 | .696 | LM14 | .460 |
| INC17 | .659 | LM15 | .508 |
| INC18 | .624 |  |  |

**References**

Arens, A. K., & Morin, A. J. (2016). Relations between teachers’ emotional exhaustion and

students’ educational outcomes. *Journal of Educational Psychology*, *108*(6), 800. doi:

10.1037/edu0000105

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance.

*Structural Equation Modeling*, *14*(3), 464-504. doi: 10.1080/10705510701301834

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale

(Grit-S). *Journal of Personality Assessment, 91,* 166–174. doi: 10.1080/00223890802634290

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis:

Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1-55.

doi:10.1080/10705519909540118

Lou, N. M., & Noels, K. A. (2017). Measuring language mindsets and modeling their

relations with goal orientations and emotional and behavioral responses in failure situations. *The Modern Language Journal, 101*(1), 214-243. doi: 10.1111/modl.12380

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-

testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing

Hu and Bentler's (1999) findings. *Structural Equation Modeling*, *11*(3), 320-341. doi:

10.1207/s15328007sem1103\_2

Van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance.

*European Journal of Developmental Psychology*, *9*(4), 486-492. doi:

10.1080/17405629.2012.686740