Brazilian Portuguese version of the Iowa Gambling Task: transcultural adaptation and discriminant validity

Versão em português do Iowa Gambling Test: adaptação transcultural e validade discriminante

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Abstract

Objective: The Iowa Gambling Task is a neuropsychological task developed in English, most widely used to assess decision-making. The aim of this work was to adapt the Iowa Gambling Task to Brazilian Portuguese, compare it with the original version and assess its validity. *Method:* We assessed 75 Brazilian adults divided into three groups: 1) 25 healthy volunteers holding the Proficiency Certificate in English tested using the English version of the Iowa Gambling Task; 2) 25 healthy volunteers who did not speak or read English tested using the Iowa Gambling Task-Portuguese; 3) 25 Attention Deficit Hyperactivity Disorder subjects tested with the Iowa Gambling Task-Portuguese. *Results:* No difference between groups 1 and 2 was observed. Nonetheless, we found significant differences between Attention Deficit Hyperactivity Disorder subjects and the other 2 groups on blocks 3, 4, 5, and on net score. *Conclusion:* Our results are similar to those previously described in the literature concerning adults without neuropsychiatric diseases. Since those two versions were equivalent and Attention Deficit Hyperactivity Disorder subjects performed significantly worse than healthy volunteers we can conclude that the adaptation of the Iowa Gambling Task to Brazilian Portuguese is valid and can be used for research purposes in the Brazilian context.

Descriptors: Attention Deficit Disorder with Hyperactivity; Iowa; Task performance and analysis; Impulsive behavior; Cognition

Resumo

Objetivo: Iowa Gambling Task *é uma tarefa neuropsicológica originalmente desenvolvida em inglês, mais usada no mundo para avaliar o processo de tomada de decisões. Este estudo pretendeu adaptar o* Iowa Gambling Task *para o português, comparar a versão adaptada com a versão original em inglês e avaliar sua validade discriminante.* **Método:** *Foram investigados 75 adultos brasileiros divididos em três grupos: 1) 25 voluntários sadios proficientes em inglês, avaliados com a versão original em inglês; 2) 25 voluntários sadios não-proficientes em inglês avaliados com o* Iowa Gambling Task-*português; 3) 25 adultos com Transtorno do Déficit de Atenção e Hiperatividade (avaliados com o* Iowa Gambling Task-*português.* **Resultados**: *Não houve diferenças entre os grupos 1 e 2. No entanto, encontramos diferenças entre os adultos com Transtorno do Déficit de Atenção e Hiperatividade e os outros dois grupos nos blocos 3, 4, 5 e no* netscore. **Conclusão:** *Nossos resultados são semelhantes aos descritos na literatura. Considerando que as duas versões se mostraram equivalentes e os sujeitos com Transtorno do Déficit de Atenção e Hiperatividade desempenharam significativamente pior do que os controles, podemos concluir que a adaptação do* Iowa Gambling Task *para o português praticado no Brasil é válida e pode ser aplicada no contexto brasileiro.*

Descritores: Transtorno da falta de atenção com hiperatividade; Iowa; Análise e desempenho de tarefas; Comportamento impulsivo; Cognição

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Introduction

Impulsiveness is a core symptom of many psychiatric diseases and may be characterized as an umbrella construct encompassing characteristics such as swift action without conscious judgment, response without adequate thought, acting with less forethought, risk-taking without planning, and making up one's mind quickly.[1] Barratt[2] has devised an important model describing the multifactorial nature of impulsiveness, grouping impulsiveness into motor impulsiveness (acting on the spur of the moment), attentional impulsiveness (not focusing on the task at hand), and non-planning impulsiveness (orientation towards the present, rather than the future).

Barratt's classification of impulsiveness presents some convergence with Bechara's model,[3] which argues that there is a functional and structural difference between motor impulsivity (related to inhibition of pre-potent responses), and decision-making (also referred to as "cognitive impulsivity.") that seems analogous with Barratt's non-planning impulsivity (behavior orientation to the present rather than to the future). Bechara also discusses another type of impulsivity, concerning the ability to inhibit irrelevant information held in working memory and to focus on the task at hand. This type of impulsivity may also be analogous with the attentional impulsivity aspect described by Barratt (lack of concentration).

The neuropsychological assessment of the motor component of impulsiveness has been carried out by use of response-inhibition tasks such as go-no-go tasks, the stop signal reaction time test, and perseverative errors on tasks such as the Wisconsin Card Sorting Test.[4] Attentional impulsiveness can also be assessed using, for instance, omission errors on tasks such as the Continuous Performance Task.[5] Concerning non-planning impulsiveness, up until the 1990s there was a lack of tools to assess non-planning impulsiveness. At this time, Bechara et al.[6] developed the Iowa Gambling Task (IGT), a paradigm that is believed to model real-life decision-making and assess cognitive (non-planning) impulsiveness.

The IGT has been used both in neurological and neuropsychiatric contexts. Decision-making problems has been identified on different populations, such as patients with ventromedial orbitofrontal lesions,[4,6] Attention Deficit Hyperactivity Disorder patients,[5,7-9] violent suicide attempters,[10] and alcoholics subjects.[11]

Briefly, on IGT, subjects have to choose one card at a time from four available decks (A, B, C and D). The task requires subjects to make 100 choices (100 trials), and in each trial, subjects may win or lose a certain amount of money. Two of the decks (A and B) yield high immediate gain, but in the long run they incur higher loss, and thus are disadvantageous decks. In contrast, the other two decks (C and D) yield relatively lower gains, but in the long run incur smaller losses, and thus are advantageous. Over the course of the trials, healthy volunteers learn to avoid the disadvantageous decks in preference for the advantageous ones. To measure performance, choices are divided into five blocks, with twenty choices each. For each block, a net score (number of cards selected from the advantageous (good) decks minus the disadvantageous (bad) decks) is obtained. A total net score from all blocks is also obtained.

The IGT was developed in English. In spite of its ease of comprehension, IGT use by individuals of other native languages could be hampered if they have cognitive/intellectual deficits, and a low educational and social profile. This study had two objectives. The first aim was to adapt the IGT to the Brazilian Portuguese (IGT-Br) and compare it with the original English version. The second aim of this study was to evaluate the construct validity of the Brazilian Portuguese adaptation of the IGT, using it to assess individuals diagnosed with ADHD and then comparing results with healthy volunteers. Our hypothesis is that there would be no difference in performance on the original IGT and the Brazilian version of the IGT. We also hypothesized that the Brazilian version of the IGT would be valid to measure the decision-making deficits present in a clinical population.

Method
1. Translation of the IGT

A researcher P.H.M (proficient in English) made the translation of IGT's text. A professional translator made the back translation. Finally, the Brazilian Portuguese translation and the back-translation were submitted to a judgment of two other researchers LFMD and DF (both proficient in English).

2. Participants

We assessed seventy-five Brazilian adults divided into three groups:

1) Twenty-five healthy volunteers (17 women and eight men) holding the Proficiency Certificate in English were recruited through advertisements in English Schools. We accepted Cambridge Certificate in Advanced English, Cambridge Certificate of Proficiency in English, International English Language Testing System, and MICHIGAN Examination for the Certificate of Proficiency in English. This group was assessed through the original version of IGT.

2) Twenty-five healthy volunteers (15 women and 10 men) who did not speak or read English, were recruited through local advertisements at universities. This group was tested using the IGT-Br.

3) Twenty-five ADHD subjects (10 women and 15 men) consecutively admitted to the GEDAHI (Learning, Attention, and Hyperactivity Disorders Research Group) were invited to participate in this study answering the IGT-Br. All subjects were diagnosed on adulthood and were of combined type.

All subjects of the three groups had at least 8 years of formal education: 13.3% had a diploma of elementary school (corresponding to eight years of schooling), 20% had a diploma of high school (corresponding to eleven years of schooling), 26.7% had incomplete university degree (corresponding to at least eleven years of schooling) and 40% had completed university degree.

Candidates from groups 1 and 2 were interviewed through the Mini-Neuropsychiatric Interview (MINI 5.0)[12] to exclude psychiatric disorders. The MINI 5.0 encompasses 17 disorders described on axis 1 of DSM-IV (including Affective Disorders, Psychotic disorders, ADHD), suicide risk and antisocial personality disorder.

ADHD subjects were diagnosed according to DSM-IV criteria and the diagnosis was carried out by at least two independent clinicians (neurologist or psychiatrist and neuropsychologist). On the day of the neuropsychological assessment, none of the ADHD individuals had used methylphenidate or any other medication used in the treatment of symptoms of inattention and/or hyperactivity. None of the patients were using long-lasting methylphenidate.

The Demographic data, including intelligence through Raven's progressive Matrices[13] are reported in Table 1.

The power analyzes of the sample size was based on a difference detected between means score of IGT's net score detected between groups 2 and 3 (d = 16). We used the following formula to compute the power of the sample

$$n = \frac{2\sigma^2 [z_{1-\alpha} + z_{1-\alpha}]^2}{d^2}$$

Table 1 - Comparison between Brazilians with proficiency in English, Brazilians with no proficiency in English and ADHD subjects on IGT and IGT-BR

	Groups						ANOVA		
	Group 1		Group 2		Group 3				
	Healthy volunteers with proficiency in English (n = 25)		Healthy volunteers with no proficiency in English (n = 25)		ADHD (n = 25)				
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	F	p	Significance
Age	28.5	6.5	32.1	8.5	31.8	9.1	1.129	0.322	N.S.
Intelligence (raw score on Raven's progressive Matrices)	51.3	4.2	50.6	3.9	50.6	4.4	0.346	0.708	N.S.
Years of formal education	13.9	2.3	13	2.2	13.3	2.4	0.321	0.726	N.S.
Performance in IGT									
Block 1 (CD-AB)	-0.10	6.58	-1.84	6.13	-2.44	5.53	1.974	0.142	N.S.
Block 2 (CD-AB)	1.59	6.07	2.92	6.34	1.32	5.75	0.935	0.395	N.S.
Block 3 (CD-AB)	6.00	5.88	5.79	7.52	2.21	7.86	4.89	0.009	G1 = G2 > G3
Block 4 (CD-AB)	6.67	8.46	7.26	7.13	1.84	7.85	8.246	0.000	G1 = G2 > G3
Block 5 (CD-AB)	7.13	9.20	7.00	8.78	2.08	8.99	5.920	0.003	G1 = G2 > G3
Net score	21.28	23.15	21.13	21.99	5.01	23.93	9.323	0.000	G1 = G2 > G3

Note: Iowa Gambling Task; (cd–ab) number of cards selected from the advantageous (C and D) decks minus the disadvantageous (A and B) decks on IGT. G1 = Group 1; G2 = Group 2; G3 = Group 3.

where n = sample size (75) σ = standard deviation (24) and d = difference between means for a significance level of 5% ($z_{1-\alpha}$ = 1.96), the power of the sample was of 96.6 ($z_{1-\beta}$ = 2.12).

The FUMEC University Ethics Review Committee had approved the study protocol (REF 262/2007). All participants signed informed consents before participating in this study.

Development of the IGT-Br:

The IGT-Br was developed in the Windows environment by the author P.H.P.M. The translation was made by two researchers who were proficient in English, and the resulting translation was subsequently approved by two other researchers also proficient in English. The adaptation maintained the same visual characteristics and schedule of reinforcement/punishment used in the original version.[4]

3. Statistical analyses

To compare the judgment of two raters about the sentence-by-sentence translation of the instructions (e.g. "I want you to select one card at a time from any deck you choose") and feedbacks (e.g. "You won $ 100") of IGT we use the Cohen Kappa's coefficient

$$\kappa = \frac{Pr(a) - Pr(e)}{1 \text{-} Pr(e)} \text{,}$$

Where Pr(a) is the relative observed agreement among raters, and Pr(e) is the probability that agreement among ratters is due to chance.

Our analyses consisted of one-way ANOVA to compare group performances on the IGT (Blocks 1 to 5 and net score) and employed the Bonferroni test to specify group differences. We use α = 0.05 as the significance level.

Results

Considering the translation of the IGT's text to Brazilian Portuguese, we found Cohen Kappa's coefficient ranging from 0.8 to 1 indicating that both raters consider the translation to the Portuguese was appropriate.

The mean of years of formal education of the sample was about 13 years. This is equivalent to college level in Brazilian Educational Classification. Nonetheless, since our sample was composed by subjects with at least 8 years of formal education, we consider this version useful for subjects with at least this same level of education (equivalent to "8th grade" or elementary school in Brazil).

No statistical differences between volunteers and patients were found regarding demographic profiles (Table 1).

No difference between groups 1 and 2 was observed, in terms of number of choices of the different card decks and on the pattern of choices over five successive blocks of 20 trials (Table 1; Figure 1). Nonetheless, we found that ADHD subjects performed worse than groups 1 and 2 on Block 3, Block 4, Block 5 and on net score (Table 1).

Discussion

Our results are similar to those previously described in the literature concerning adults without neuropsychiatric disorders.[4,6] Healthy volunteer subjects attained a learning curve over the course of the trials, making more advantageous choices throughout the task. No difference was found between group 1 and 2, or in equivalence between the IGT and IGT-Br.

ADHD subjects performed significantly worse than those from Groups 1 and 2, suggesting that individuals with ADHD make less advantageous decisions than those without ADHD. These data points to discriminant validity of the IGT-Br. Our results were similar to those of an earlier investigation using the original English version of the test to assess ADHD children,[9] adolescents[7-8] and adults.[5]

Using a child's adaptation of IGT, Garon et al.,[9] have found deficits in decision-making in children with pure ADHD (n = 11), as compared to children with ADHD associated with internalizing symptoms (n = 11), and as compared to matching controls (n = 21). Pure ADHD subjects made more disadvantageous choices on the last two blocks of choices (total of 4 blocks). Using the IGT, Toplak et al.,[7] have showed a pattern of poor decision-making in adolescents with ADHD (n = 36), in comparison to controls (n = 34). These results were similar to those reported by Ernst et
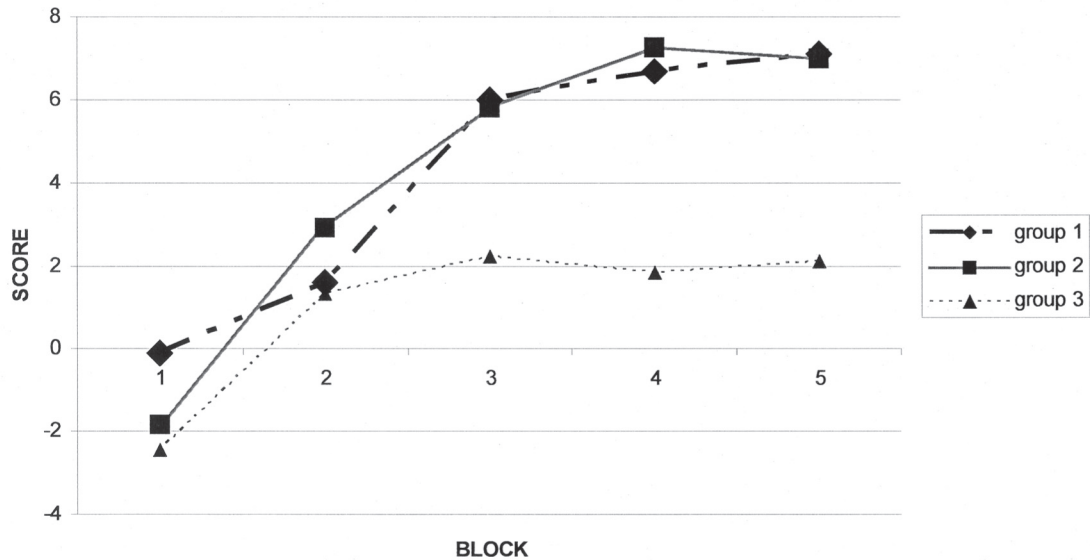
Figure 1 – Comparison between Brazilian adults with proficiency in English; Brazilian adults without proficiency in English and subjects on the five consecutive blocks of IGT
Note: group 1 = Healthy volunteers with proficiency in English (n = 25); group 2 = Healthy volunteers with no proficiency in English (n = 25); group 3: Attention Deficit/Hyperactivity Disorder subjects (n = 25).

al.,[8] in a study comparing adolescents with disruptive behaviors (including ADHD) to matching controls. Malloy-Diniz et al.,[5] have also found differences between adults with ADHD (n = 50) and healthy controls (n = 51) on IGT. In that study, individuals with ADHD made more disadvantageous choices than healthy controls and the pattern of choices were similar to the present study with statistically significant differences on the third, fourth and fifth blocks.

The pattern of differences on the last IGT's blocks between healthy volunteers and ADHD subjects has been consistently shown regardless the age of subject.[5,9] This finding can suggest that ADHD subject's fails to learn from experience and also could represent a pattern of non-planning impulsivity. In agreement with this hypothesis, Malloy-Diniz et al.,[5] have found a negative correlation between the scores on non-planning impulsivity measured by the Barratt Impulsiveness Scale (BIS-11) and the net score of choices on the last blocks of IGT.

Our study has some limitations. We did not use random assignment to the English or Portuguese version of IGT in the bilingual group. We also did not use case matching criteria to select subjects for the ADHD group. Furthermore, we did not make comparisons between inattentive and combined subtypes of ADHD, or between ADHD subgroups with different comorbid disorders. The effects of different ADHD subtypes and comorbid conditions on the IGT's performance should be addressed in future studies to clarify the generalization of the use of IGT to identify decision-making deficits on subjects according to its subtype and comorbidity. These limitations hinder the generalization of our results.

These results are compatible with the hypothesis of Decision-Making Deficits in ADHD subjects. Therefore, we can conclude that the adaptation of the IGT to Brazilian Portuguese is valid and can be used for research purposes in the Brazilian context. Future studies with the IGT-Br on another clinical populations and subjects with low educational level could add more information about the validity of these tasks on our context.

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