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original article

Reproducibility of adolescent sedentary activity questionnaire (ASAQ) in Brazilian adolescents

Reprodutibilidade de questionário de atividades sedentárias para adolescentes brasileiros

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Abstract – The aim of this study was to assess the validity and reproducibility of a self-report questionnaire on sedentary behavior (Adolescent Sedentary Activity Questionnaire: ASAQ) among Brazilian adolescents. The sample consisted of 122 adolescents (62 females) aged between 12 and 17 years. ASAQ was developed and validated for adolescents in Australia (Hardy et al, 2007), and for its use in Brazil a transcultural adaptation to Portuguese was done, followed by an assessment of ASAQ's contents by experts. Then, ASAQ was administered within schools, on a typical school day, followed by a retest administration four days later. Total sedentary time was calculated for weekdays and weekends. Intra-class correlation coefficient (ICC) and confidence interval (CI95%) were calculated for both sexes. QASA (acronym for ASAQ Portuguese version) has 13 questions divided into five categories: screen recreation, educational, transportation, cultural activities, and social activities. ICC for total time spent on sedentary behavior was 0,88 (CI95%=0.82-0.91) for weekdays, and 0,77 (CI95%= 0.68-0.84) for weekends. Between categories of sedentary behavior, ICC values varied from 0.75 (CI95%=0.65-0.83) for transportation to 0.94 (CI95%=0.92-0.96) for screen recreation on weekdays, and from 0.40 (CI95%=0.15-0.58) for transportation to 0.90 (CI95%=0.86-0.93) for screen recreation on weekends. In general, ASAQ had a satisfactory reproducibility for the assessment of sedentary behaviors among young people in Brazil.

Key words: Adolescents; Reliability; Sedentary lifestyle; Validity.

Resumo – *O objetivo do estudo foi verificar a validade e reprodutibilidade do questionário para avaliar comportamentos sedentários em adolescentes (ASAQ), no Brasil. A amostra foi composta por 122 adolescentes (62 meninas), entre 12 e 17 anos. O questionário ASAQ foi desenvolvido e validado para adolescentes na Austrália, (Hardy et al., 2007) e, para a sua utilização no Brasil, realizou-se a adaptação transcultural para a língua portuguesa e, em seguida, a avaliação do conteúdo das questões contidas no questionário por especialistas. Após essa primeira etapa, realizou-se a aplicação do instrumento no interior de escolas, num dia típico de aula e a reaplicação após quatro dias. O tempo total sedentário foi calculado para dias da semana e para os dias do final de semana. O coeficiente de correlação intraclasse (CCI) e os intervalos de confiança (IC-95%) foram calculados para ambos os sexos. O questionário na versão brasileira (QASA) contém 13 questões, divididas em cinco aspectos, sendo eles: recreação por meio de tela, educacional, transporte, atividades culturais e sociais. Encontrou-se um CCI de 0,88 (IC-95%=0,82-0,91) para o tempo total sedentário durante a semana e 0,77 (IC-95%= 0,68-0,84) para o final de semana. Entre os aspectos, observou-se que os CCI variaram entre 0,75 (IC-95%=0,65-0,83) para o Transporte a 0,94 (IC-95%=0,92-0,96) para Recreação em tela, nos dias da semana e, 0,40 (IC-95%=0,15-0,58) para o Transporte a 0,90 (IC-95%=0,86-0,93) para Recreação em tela nos dias de final de semana. Pode-se concluir que o QASA demonstrou evidências de reprodutibilidade satisfatórias para utilização no Brasil.*

Palavras-chave: *Adolescentes; Estilo de vida sedentário; Reprodutibilidade; Validação.*

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INTRODUCTION

Technological advances of the last decades have promoted an increase in availability of free time as well as in sedentary activities among adults, children and adolescents. This fact has been contributing to an increase in sedentarism among the world's population[1].

Several studies indicate that a sedentary lifestyle is a risk factor for several chronic degenerative diseases, especially obesity and cardiovascular diseases[1-4]. According to the American Academy of Pediatrics[5], sedentary activities lasting for more than two hours (TV, DVDs, video games, computer) can be harmful to the health of children and adolescents.

Moreover, this type of behavior may encourage the consumption of food with high fat and sugar content[6,7], and lead to a decrease in regular physical activity[8].

Sedentarism has grown increasingly, and this trend is not restricted to adults. It is estimated that in the United States, as well as in Brazil, young people spend about 75% of the day in sedentary activities[9].

A study conducted in state capitals and Distrito Federal[10], interviewing 60,973 young Brazilians, aged from 13 to 15 years, showed that 79.4% of boys and 79.5% of girls spend two or more hours a day in front of the TV.

Most studies on sedentary behavior among adolescents focus on the time spent with electronics for entertainment, such as TV, computers and video games[9], since these factors are the major contributors to physical inactivity among individuals of this age group[11]. In Brazil, few studies have examined sedentary behavior including other aspects of sedentarism besides screen recreation[9,12].

We know that behaviors acquired in early stages of life tend to go on in adulthood[13]. Thus, the development of studies on time spent in sedentary activities among children and adolescents shows itself as an important factor for better understanding these sedentary habits, being able to intervene in order to prevent an increase in this health-risking type of behavior.

Several studies used instruments in the form of a recall of time spent in screen recreation for assessing sedentary behavior in adolescents[10,12]. An alternative that shows itself as a better method for assessing general sedentary behavior is the Adolescent Sedentary Activity Questionnaire (ASAQ)[14]. This instrument was developed and validated by Hardy et al.[14] in Australian adolescents and involves several categories of sedentary activities, which are present in the lives of many young people.

To date, according to a review conducted by the authors in two databases (LILACS and SCIELO), the Adolescent Sedentary Activity Questionnaire (ASAQ) has not been validated for its use among Brazilian adolescents. Thus, this study aims to make a transcultural adaptation, perform content validation, and assess the reproducibility of Questionário de Atividades Sedentárias em Adolescentes Brasileiros (QASA – acronym in Portuguese).

METHODOLOGICAL PROCEDURES

Transcultural Adaptation and Content Validation

For transcultural adaptation of ASAQ, Van de Vijver and Hambleton[15] recommendations were followed. The first step was to translate the original questionnaire from English to Portuguese. This procedure was performed by a Brazilian with extensive knowledge of the English language. Then, a Native American, living in Brazil, translated the Portuguese version to English. The two English versions were compared and some adjustments were made.

After these adjustments, a new version was sent to three experts to perform content validation. They suggested some changes, for example: inserting the items "playing video games" and "time sitting in a classroom," as well as some examples to clarify aspects mentioned in the questionnaire, such as "play or practice a musical instrument (*without physical exertion*)."

After receiving the suggestions, a consensus between the authors and experts was established. Thus, the final version was met in total agreement of all involved.

This final version of QASA maintains in its composition five categories of sedentary activities. Peculiarities of the adjustment process are better described in Box 1. To ensure understanding on questions, as well as for assessing their reproducibility in Brazilian adolescents, QASA was administered in two different opportunities.

Box 1. Categories and items of QASA and ASAQ

Original version (English)		Portuguese version (Brazil)
Adolescent Sedentary Activity Questionnaire (ASAQ)		Questionário de Atividades Sedentárias para Adolescentes (QASA)
Aspects	Suggested activities	Changes
Screen recreation	Watch TV; Watch videos/DVDs; Use the computer for leisure (surf in the internet, play games, MSN, chat).	Insertion of the item "go to the Movies" in the question on videos and DVDs ; Insertion of a specific question for the item videogame.
Educational	Use the computer for doing homework; Do homework or study without using the computer; Take a course or take private lessons.	Insertion of the question on the time spent sitting in the classroom.
Cultural	Reading for leisure; Handicraft or other type of manual hobby; Play/practice a musical instrument.	Insertion of the term "without physical exertion" in the question on play/practice a musical instrument.
Social	Chat with friends/stay on the telephone/listen to music; Have class in a classroom on Saturday or go to church.	Insertion of the term "mess around" and "relax" in the question on chat with friends.
Transport	Travel or move (by car/bus/subway/motorcycle).	Unchanged

Sample

This study was conducted in accordance with resolution 196/96 of Conselho Nacional de Saúde and approved by the Ethics Committee of Universidade Federal do Paraná, protocol nº 0164.0.091.000-11.

For transcultural adaptation, content validation and reproducibility assessment of QASA, this study had a descriptive and cross-sectional character, using a convenience sample consisted of 122 adolescents (62

girls) from the cities of Foz do Iguaçu and Curitiba, both located in the state of Paraná, chosen by similarity of administrative characteristics (two institutions of public education), geographic location (both are located in neighborhoods with high purchasing power), students' socioeconomic level similarity and similarity of cities educational HDI level, which is 0.946 in Curitiba, and 0.905 in Foz do Iguaçu[16].

We found a posteriori that the analysis of the intra-class correlation coefficient (ICC) for this study's sample showed a power of 0.94, with an effect of 0.40, which is considered a fair correlation, so the minimum sample size required to show reproducibility effects of the questionnaire was 78 participants, adopting a power of 0.80 and $\alpha=0.05$[17].

All participants were authorized by their parents or guardians, who signed of a term of informed consent, to participate of the study. Participants completed the questionnaire on the first day of administration and on the fourth day (second administration), and provide data on gender and date of birth. We should highlight that the first administration was held on Monday and Tuesday, and the second administration on Thursday and Friday, in the same week.

QASA

The Brazilian version for ASAQ is composed of 13 items, divided into five aspects, in which participants report the time spent in sedentary activities in hours and/or minutes during each weekday and during a typical weekend (Appendix 1).

The questionnaire administration must follow these procedures in order to avoid possible errors: a) verification of each student responses to clarify some questions, such as take into account that the sedentary time cannot extrapolate 24h a day, and request to adolescents to remember the sleep time and time spent in physical activities, so that the measuring of sedentary time is not overrated. b) consideration of other aspects that can foster errors in completing the questionnaire, such as: excessive time spent in only one activity; doubling the time spent on activities that can be performed simultaneously, like doing homework in front of the TV, so the time spent on each activity should be targeted (e.g. 1h of activity = 45 minutes watching TV and 15 minutes doing homework); lack of fields completed, since the absence of the practice of an activity must be marked with a "0"; regarding transportation-related activities during weekdays, in case an adolescent marks with a "0" this field, verify if he uses active transportation for his locomotion and actually discards the passive one; make sure that all times reported are viable. c) emphasize the importance of remembering a typical and normal week for answering questions.

Questionnaire administration

The questionnaire administration was performed during physical education classes, in a classroom, by a team trained by Centro de Pesquisa em Exer-

cício e Esporte of Universidade Federal do Paraná. Data were collected in two educational institutions, Instituto Federal do Paraná, in Foz do Iguaçu (n=71), and Escola Estadual Ernani Vidal, in Curitiba (n=51).

Before QASA administration, researchers and students did a joint reading of it. On this occasion the questionnaire filing instructions were given. Students were asked to recall their daily activities and report how many hours and/or minutes they usually spent on each one.

Some questions were explained in more detail, such as questions related to computer use for leisure, being emphasized that this activity included reading e-mail, chat, blogs, surfing on the internet, social networks. In questions related to transportation to school or to church on weekends, we emphasize that this item means attending classes or community meetings aimed at cultural and/or religious activities.

Whenever adolescents marked two activities at the same time, for example, reading for pleasure in front of the TV, we instructed them to target periods of time spent on each activity, without doubling the time.

After completing QASA, adolescents requested the presence of the evaluator for conference and gathering of the questionnaire. The maximum time for questionnaire completion in each group of adolescents was 25 minutes.

Data analysis

Data were directly entered into a spreadsheet of SPSS version 19.0 software. The number of minutes spent by each adolescent in each sedentary activity was calculated, as well as the total time – the sum product of all sedentary activities performed. These calculations were computed for weekdays and weekend. Results were stratified by sex and age group (from 12 to14 years, and from 15 to 17 years).

The Kolmogorov-Smirnov normality test was used to identify data normality. After that, comparisons for both sexes were made between the 1st and 2nd questionnaire administration, using the Wilcoxon test for non-parametric variables ('Total Sedentary Time' and 'Sedentary Time from Monday to Friday' for boys; 'Total Sedentary Time', 'Sedentary Time from Monday to Friday' and 'Sedentary Time on Weekend' for girls) and the paired Student t test (for the variable 'Sedentary Time on Weekend' for boys).

To assess the consistency of responses for the two QASA administrations, we used the average intra-class correlation coefficient (ICC) with a confidence interval of 95% (CI95%).

According to Landis and Koch[17], values lower than 0.40 express low correlation; values between 0.40 and 0.75 express from fair to good correlation; and values greater than 0.75 express excellent correlation.

Finally, an agreement analysis was performed using the Bland-Altman graph, in order to assess differences between the two QASA administrations in each of the sample subjects regarding Total Sedentary Time on weekdays and weekend.

RESULTS

The mean age of the sample was 14.0 ± 1.4 years. The median total time spent in sedentary activities for weekdays and weekend on the two QASA administrations are described in Table 1.

Table 1. Time spent in sedentary activities for both sexes and both QASA administrations (hours)

	Boys		Girls	
	1st Administration Median (Amplitude)	2nd Administration Median (Amplitude)	1st Administration Median (Amplitude)	2nd Administration Median (Amplitude)
Total time	93h00′ (49h20′ – 143h20′)	94h15′ (44h40′ – 147h00′)	101h45′ (44h00′- 153h40′)	101h45′ (43h10′ – 153h40′)
Weekdays	68h20′ (29h45′ - 109h45′)	69h07′ (29h30′ - 117h30′)	74h45′ (35h30′ - 114h40′)	71h35′ (35h00′ - 115h39′)
Weekend	27h25′ (02h00′ – 45h30′)	26h00′ (03h00′ – 42h00′)	28h30′ (08h30′ – 45h00′)	29h07′ (08h07′ – 44h40′)

There were no significant differences between the mean time spent in sedentary activities in both QASA administrations ($p<0.05$).

ICC for total sedentary time, according to each category of sedentary activity, for both weekdays and weekends, are shown in Table 2.

ICC values observed in this sample for the full week were mostly ≥0.70, except for the Social aspect in boys aged from 15 to 17 years.

When the separation between weekdays and weekend took place, there was a downward trend in ICC values in the weekend, especially regarding to the Cultural aspect in younger boys, the Social one in younger boys and younger girls, and the Transportation one in both sexes and age groups.

Results of Bland-Altman analysis is shown in Figure 1. This analysis identifies the intra-subject variability between the two QASA administrations. In most cases, there was an agreement between total sedentary time in both administrations. Individuals who had less sedentary time showed more consistency in their responses.

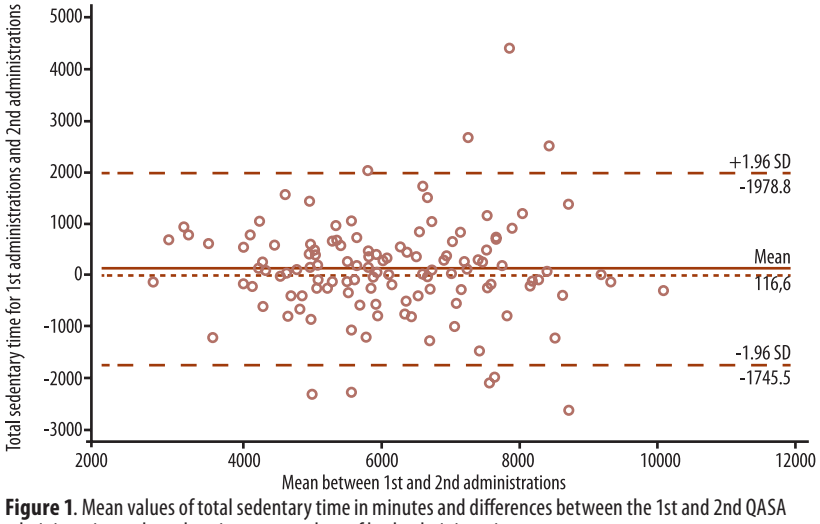

Figure 1. Mean values of total sedentary time in minutes and differences between the 1st and 2nd QASA administrations, plotted against mean values of both administrations.

Table 2. Intra-class correlation coefficient (ICC) and confidence interval of 95% (CI95%) for sedentary behavior, according to weekdays, weekend and age group

	12-14 years		15-17 years	
	Boys (N=37)	Girls (N=34)	Boys (N= 23)	Girls (N=28)
Full week	ICC (CI95%)	ICCI (CI95%)	ICC (CI95%)	ICC (CI95%)
Total	0.92 (0.74-0.92)	0.85 (0.64-0.93)	0.89 (0.77-0.94)	0.93 (0.85-0.96)
Screen recreation	0.94 (0.89-0.97)	0.93 (0.87-0.97)	0.94 (0.86-0.97)	0.97 (0.94-0.99)
Educational	0.98 (0.97-0.99)	0.99 (0.98-0.99)	0.97 (0.93-0.99)	0.85 (0.97-0.93)
Cultural	0.87 (0.76-0.93)	0.94 (0.89-0.97)	0.98 (0.95-0.99)	0.82 (0.62-0.93)
Social	0.81 (0.83-0.12)	0.78 (0.47-0.87)	0.57 (-0.01-0.82)	0.98 (0.86-0.97)
Transportation	0.96 (0.93-0.98)	0.97 (0.93-0.98)	0.96 (0.96-0.91)	0.92 (0.82-0.96)
Weekdays	ICC (CI95%)	ICC (CI95%)	ICC (CI95%)	ICC (CI95%)
Total	0.90 (0.80-0.95)	0.90 (0.80-0.95)	0.73 (0.36-0.88)	0.89 (0.76-0.95)
Screen recreation	0.95 (0.91-0.97)	0.95 (0.91-0.98)	0.88 (0.78-0.95)	0.92 (0.83-0.96)
Educational	0.84 (0.67-0.91)	0.87 (0.75-0.94)	0.82 (0.57-0.92)	0.73 (0.43-0.89)
Cultural	0.77 (0.56-0.88)	0.72 (0.44-0.86)	0.77 (0.45-0.90)	0.77 (0.50-0.89)
Social	0.90 (0.81-0.95)	0.85 (0.70-0.92)	0.64 (0.15-0.84)	0.91(0.80-0.95)
Transportation	0.91 (0.83-0.95)	0.67 (0.34-0.83)	0.40 (-0.40-0.74)	0.84 (0.67-0.93)
Weekend	ICC (CI95%)	ICC (CI95%)	ICC (CI95%)	ICC (CI95%)
Total	0.84 (0.69-0.92)	0.73 (0.47-0.87)	0.84 (0.63-0.93)	0.58 (0.09-0.80)
Screen recreation	0.88 (0.78-0.94)	0.87 (0.73-0.93)	0.93 (0.84-0.97)	0.94 (0.88-0.97)
Educational	0.74 (0.49-0.86)	0.88 (0.77-0.94)	0.67 (0.23-0.86)	0.81 (0.60-0.91)
Cultural	0.68 (0.39-0.84)	0.89 (0.78-0.94)	0.87 (0.70-0.94)	0.17 (-0.80-0.61)
Social	0.54 (0.12-0.76)	0.02 (-0.96-0.51)	0.83 (0.61-0.93)	0.70 (0.34-0.86)
Transportation	0.59 (0.21-0.79)	0.47 (-0.05-0.74)	-0.05 (-1.48-0.55)	0.57 (0.06-0.80)

DISCUSSION

Results of this study show that QASA has fair to excellent reproducibility in Brazilian adolescents, except for Transportation-related items among boys (from 15 to 17 years) and Cultural-related items among girls (from 15 to 17 years).

High ICC values were expected since picking an instrument for adaptation already favors a positive psychometric history, and so the assessment of absolute ICC values becomes not so important, but rather if they converge with findings of studies that used the original instrument[18].

Thus, the low correlation of the aspect Transportation corroborates values found by the study of Hardy et al.[14], which showed ICC equal to 0.01 and 0.38 in male students of the 8th grade of Elementary School and the 1st year of High School, respectively. These findings suggest that the aspect Transportation is a limitation of the validated questionnaire in this study.

We observed that highest values of reproducibility, both for weekdays and weekend, were related to screen recreation, a result that was also similar to survey data from Hardy et al.[14]. This fact is due to this category of sedentary activity be practiced by most adolescents these days[11] and be the most present one in studies, which consider it as a risk factor for overweight and obesity[7,19], development of metabolic syndrome[4] and cardiovascular diseases[3].

The downward trend of ICC values on weekend, especially in Cultural, Social, and Transportation aspects, converge with findings from studies that used the original instrument, and can be related to the instability of these behaviors over time, especially to behavioral variability, and not to low reproducibility, since weekend behaviors may vary under the influence of the weather and opportunities to practice physical activity[14]. From this, the importance of the explanation that must be provided to students regarding the remembering of a typical week for QASA completion is verified, avoiding significant variations.

The Bland-Altman analysis showed variability in consistency of responses according to the total sedentary time in each individual. As the sedentary time reported by adolescents increased, the variability between QASA administrations also increased.

This can be explained by the fact that individuals with less time spent in sedentary activities may have greater ease of remembering their sedentary behaviors, as well as time spent on each aspect. Another explanatory factor is the instability of some behaviors, complicating the remembering process in individuals who reported high sedentary time, for example, in the question "Mess around."

However, we should highlight that even with decrease in consistency of responses as total sedentary time increased, in most cases, these values were within the confidence interval of 95%.

Findings of this study indicate that QASA administration in Brazilian adolescents showed psychometric aspects similar to the original instrument, meeting mostly good to excellent reproducibility, showing itself to be a good instrument for identifying several sedentary behaviors in this population.

Regarding study limitations, we highlight the lack of concurrent validation with a gold standard instrument, such as the accelerometer or the doubly labeled water (DLW). Apart from this, there was also a lack of measurement of the average time for questionnaire completion in both schools, showing only the maximum time for it.

The validation process for instruments related to sedentary behavior shows itself as a challenge to researchers all around the world, because it depends basically on two strategies: direct observation or the use of instruments that are able to measure these behaviors more accurately, such as accelerometers. Given this fact, it is suggested that further studies should be conducted using QASA, especially with samples and sociocultural contexts different to those covered by this study, as well as analyses according to categories of functional literacy.

CONCLUSION

We concluded that QASA showed evidence of satisfactory reproducibility for its use in Brazil.

In highly sedentary individuals, accuracy between responses can be affected, having as main explanatory factors the ability of remembering and temporal instability of some behaviors, but it still has acceptable variability.

Thus, it is suggested that QASA is an appropriate instrument for assessing different aspects of sedentary behavior among adolescents with characteristics similar to those who participated of this study.

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Appendix 1. Questionário de Atividades Sedentárias em Adolescentes Brasileiros (QASA – Brazilian version for ASAQ)

Pense em uma *semana típico* do seu ano letivo, de segunda a sexta-feira, e escreva abaixo quanto tempo aproximadamente você gasta com cada uma das seguintes atividades todos os dias.										
Atividade	Segunda-Feira		Terça-Feira		Quarta-Feira		Quinta-Feira		Sexta-Feira	
	Horas	Minutos	Horas	Minutos	Horas	Minutos	Horas	Minutos	Horas	Minutos
Assistir televisão										
Ver vídeos/DVDs/Cinema										
Jogar videogame										
Usar o computador para o seu lazer (navegar na internet, jogar, MSN, Chat)										
Usar o computador para fazer a sua lição de casa										
Fazer sua lição de casa/trabalhos da escola ou estudar sem utilizar o computador										
Ler por lazer										
Fazer algum curso ou ter aulas particulares										
Viajar ou se deslocar (de carro/ônibus/metrô/motocicleta)										
Fazer artesanato ou outro tipo de hobby manual										
Ficar à toa (conversar com amigos/ficar no telefone/ouvir música/ficar relaxando)										
Tocar/praticar um instrumento musical (sem esforço físico)										
Tempo sentado em sala de aula										
Pense em um *fim de semana típico* e escreva abaixo quanto tempo você gasta aproximadamente com cada uma das seguintes atividades no *fim de semana*.										
Atividade		Sábado					Domingo			
		Horas		Minutos			Horas		Minutos	
Assistir televisão										
Ver vídeos/DVDs/Cinema										
Jogar videogame										
Usar o computador para o seu lazer (navegar na internet, jogar, MSN, Chat)										
Usar o computador para fazer a sua lição de casa										
Fazer sua lição de casa/trabalhos da escola ou estudar sem utilizar o computador										
Ler por lazer										
Fazer algum curso ou ter aulas particulares										
Viajar ou se deslocar (de carro/ônibus/metrô/motocicleta)										
Fazer artesanato ou outro tipo de hobby manual										
Ficar à toa (conversar com amigos/ficar no telefone/ouvir música/ficar relaxando)										
Tocar/praticar um instrumento musical (sem esforço físico)										
Ter aulas em sala na escola ao sábado ou ir à igreja										