

La validez aparente y de contenido de imágenes relacionadas con el tabaquismo y sus controles pareados

Face and content validity of smoking-related and matched control pictures*
Construção e validação de imagens relacionadas ao cigarro e seus controles pareados

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Abstract

Smoking-related pictures and matched controls are useful tools in experimental tasks of attentional bias. It is noteworthy that the procedures used to produce and validate these pairs of pictures are poorly reported. This study aimed to describe the production and evidence of validity of a set of smoking-related pictures and their matched controls. Two studies were conducted to assess validity. An online internet-based survey was used to assess face validity of 12 pictures related to smoking behavior and 12 matched controls. All pictures were colored and were 95mm length x 130mm width. Participants were asked whether the pictures were related or not to the smoking behavior and also rated how much each picture was related to smoking behavior. The second study investigated attentional bias in smokers ($n = 47$) and non-smokers ($n = 50$), and examined how they

assessed all pictures in terms of pleasantness and the 12 smoking-related pictures in terms of relevance to their own smoking behavior. Craving was assessed before and after the experiment. Results indicate that this set of pictures is valid since smoking-related pictures were considered more related to smoking behavior compared to their matched controls. Moreover, smokers showed greater attentional bias for smoking-related pictures than non-smokers. Craving and relevance of the smoking-related pictures were higher in smokers than in non-smokers. Smokers considered smoking-related pictures less unpleasant than non-smokers. These findings provide evidence of face and content validity of this set of pictures, which will be available to researchers, contributing to the maximization of the standardization of future investigations.

Keywords: attentional bias, smoking-related pictures, validity, standardization

* This work originated in two surveys made in the Universidade Federal do Rio Grande do Sul.

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Resumen

Las imágenes relacionadas con el tabaquismo y sus controles emparejados son herramientas útiles en tareas experimentales de sesgo atencional. Cabe destacar que los procedimientos usados para producir y validar estos pares de imágenes son informados de manera deficiente en los estudios. Este estudio tuvo como objetivo describir la producción y evidencia de validez de un conjunto de imágenes relacionadas con el tabaquismo y sus controles. Se realizaron dos estudios para evaluar la validez. Se utilizó una encuesta por Internet hecha en línea para evaluar la validez de 12 imágenes relacionadas con el hábito de fumar y 12 controles emparejados. A los participantes se les preguntó si las imágenes estaban relacionadas o no con la conducta de fumar y también valoraron hasta qué punto cada imagen estaba relacionada con el hábito de fumar. El segundo estudio investigó el sesgo de atención en los fumadores ($n=47$) y no fumadores ($n=50$), y examinó cómo evaluaron todas las imágenes en términos de agrado y las 12 imágenes relacionadas con el tabaquismo en términos de relevancia respecto a la conducta de fumar. Se evaluó el deseo de fumar antes y después del experimento. Los resultados indican que este conjunto de imágenes es válido ya que las imágenes relacionadas con el tabaquismo se consideraron más asociadas con el hábito de fumar, en comparación con los controles. Además, los fumadores mostraron un mayor sesgo atencional para imágenes relacionadas con el tabaquismo que los no fumadores. El deseo de fumar que inspiraron las imágenes relacionadas con el tabaquismo y su relevancia fueron mayores en los fumadores que en los no fumadores. Los fumadores, en comparación con los no fumadores, consideraron las imágenes relacionadas con el tabaquismo menos desagradables. Estos hallazgos proporcionan evidencia de la validez aparente y de contenido de este conjunto de imágenes, que estarán a disposición de los investigadores, contribuyendo a maximizar la estandarización de las futuras investigaciones. *Palabras clave:* sesgo atencional, validez, tabaquismo, estandarización

Resumo

Imagens relacionadas ao cigarro e seus controles pareados são ferramentas úteis para investigar viés atencional,

agradabilidade, fissura e relevância de tais estímulos para o comportamento adictivo. Estudos sobre desenvolvimento e validação de tais imagens são escassos, dificultando a comparação de resultados devido ao uso de diferentes estímulos. Este estudo teve como objetivo descrever o processo de desenvolvimento e validação de um conjunto de imagens (12 cigarro e 12 controles) para fornecer um banco de imagens padronizadas. Dois estudos foram conduzidos, sendo o primeiro uma enquete através da internet para acessar a validade de face. Os participantes responderam se as imagens eram relacionadas ou não ao comportamento de fumar e classificaram o quanto cada uma era relacionada a este comportamento. O segundo examinou agradabilidade, relevância e fissura provocada pelas 12 imagens cigarro. Os resultados indicaram que todas imagens cigarro eram válidas, pois todos os participantes as consideraram mais relacionadas ao comportamento de fumar comparadas com as controles. Fissura e relevância foram mais altas nos fumantes e estes consideraram as imagens cigarro menos desagradáveis do que os não fumantes. Estes achados promovem validade de face e de conteúdo deste conjunto de imagens que estará disponível aos pesquisadores, contribuindo para maximizar a padronização de futuras investigações.

Palavras-chave: imagens relacionadas ao cigarro, reatividade a pistas, validação, padronização

Experimental tasks on reactivity to cues related to smoking behavior conducted in laboratories may produce different results due to the use of different stimuli. Although the visual probe task has been widely used to assess attentional bias in smokers, studies in general match substance-related and control stimuli on basic perceptual features such as dimensions, colors, brightness and complexity, paying less attention to the types of visual cues and to how these attributes themselves might affect attentional bias (Miller & Fillmore, 2010). Despite the cultural differences, the comparability of results would be much higher if validated stimuli and matched target and control pictures were used. The use of smoking-related pictures in experiments on nicotine addiction is very common, and a validated database of pairs of pictures is necessary in this field.

The addicts tend to perceive the stimuli associated to the drug with a positive valence compared to non-dependent individuals (Field, Mogg, Zetteler, & Bradley, 2004). It has already been demonstrated in the literature that drug users tend to identify the stimuli associated with drug as positive compared to other environmental stimuli (Field et al., 2004), i.e., stimuli associated with cigarette can be appetitive to smokers (Mucha, Geier, & Pauli, 1999). In addition to this assessment bias, *in vivo* cues associated with consumption of tobacco and smoking-related pictures attract the attention of the smoker (attentional bias) and are able to induce or increase craving (Carter & Tiffany, 1999; Field & Cox, 2008). However, although some studies have demonstrated the relationship between craving and attentional bias in alcohol abusers (Field et al., 2004) and cannabis users (Field, Eastwood, Bradley, & Mogg, 2006), others did not show significant correlation between these two variables in smokers (Bradley, Field, Healy, & Mogg, 2008; Ehrman et al., 2002; Waters, Shiffman, Bradley, & Mogg, 2003), indicating that they may not be related or that for some reason the stimuli used didn't induce those phenomena. Thus, studies using visual probe measures could provide somewhat inconsistent findings due to parameters such as picture complexity and attentional bias measurement method.

Different experimental approaches, based on different theoretical models of addiction, use pictures or objects to investigate physiological or behavioral responses to stimuli associated with drugs. The cue reactivity refers to the variety of responses that are observed when the drug addicts, former addicts or frequent users are exposed to some stimuli that were previously associated with the drug effects (Rooke, Hine, & Thorsteinsson, 2008). The assessment of cue reactivity can be made through psychophysiological parameters such as electrocardiographic measurement and skin conductance response, or also through experimental tasks, such as the assessment of attentional bias by visual probe task (Rooke et al., 2008; Vollstädt-Klein, Loeber, von der Goltz, Mann, & Kiefer, 2009), introduced by MacLeod, Mathews and Tata (1986).

The visual probe task consists of a pair of stimuli (pictures or words) that is displayed simulta-

neously on a computer screen. Then both stimuli disappear and one of them is immediately replaced by an arrow. Participants are asked to indicate as quickly as possible the direction in which the arrow points (up or down). The latency of the responses works as an indicator of visual attention to the stimulus presented (Townshend & Duka, 2001). That is, lower reaction times when the arrow replaces a particular class of stimuli indicate attentional bias to this class. This paradigm has been widely used in researches on addictive behaviors (Robbins & Ehrman, 2004). In general, drug users have lower reaction times when the arrow replaces stimuli (words or pictures) related to their drug of choice than when the arrow replaces control or neutral stimuli.

In the case of smokers, several studies using a visual probe task have demonstrated that they are quicker to respond when the arrow replaces pictures related to the smoking behavior, indicating an attentional bias to this class of stimuli (Bradley, Field, Mogg, & De Houwer, 2004; Mogg, Field, & Bradley, 2005). However, an important limitation of the studies on reactivity to cues that use pictures is that each laboratory produces their own stimuli, what can produce a bias in results comparison. To our knowledge, standardized smoking-related stimuli and matched controls adapted for studies with smokers are not available. A major concern of the researchers on the subject is to produce matched stimuli. For this reason some researches produce all the pictures (Bradley, Mogg, Wright, & Field, 2003; Mogg, Bradley, Field, & De Houwer, 2003), what requires an extra effort, while others mix their own production with other pictures already commonly used in studies with smokers (Mogg et al., 2005; Waters et al., 2003). On the other hand, it has already been shown that the cue type can affect the attentional bias in alcohol abusers, since they were more sensitive to emotional stimuli when compared to non-abusers (Stormack, Laberg, Nordby, & Hudahl, 2000), what suggests that the emotional content of the stimuli must be controlled.

With this variety of pictures, there is a possible problem: the pair may not have the same context, colour, size and complexity, what affects the validity and reliability of the comparison of results,

because significant differences could depend on the stimuli properties. According to Carter and colleagues (2006), a more rigorous choice of stimulus and presentation of evidence of validity should be adopted by researchers. Different techniques can be employed to provide evidence of validity, including qualitative analyses, such as assessing the suitability of the content and format, for example, and quantitative analyses, which includes statistical procedures to determine the psychometric properties of items based on previously collected answers. Their validity depends on the evidence which can be gathered to support any inferences made from test results or other experimental methods. Just like the tests are analyzed, the individual items that compose them must also be analyzed in order to ensure their quality for the purposes of the test as a whole (Urbina, 2007).

In order to overcome this limitation in the experimental research on cue reactivity and, in particular, in attentional bias tasks for smoking-related cues, this study aimed to gather evidence of face and content validity of smoking-related pictures developed to compose an attentional bias task. Thus, after the process of generating pictures related to smoking behavior and selecting paired control pictures, two studies were performed.

Method

Producing matched pictures

Initially, 126 pictures were taken using a digital camera (14 megapixels), of which 63 were related to smoking behavior (e.g., cigarette pack, lighter) and 63 were control pictures (e.g., wallet, cell phone). All photographs were printed in size 10 cm x 15 cm and identified on the back with a three-letter code. Combinations of consonants were used to identify smoking-related pictures, and combinations of vowels identified control pictures. This code was intended to identify the 63 pairs following a previous selection criterion of pertinence of the pictures (e.g. photograph UAI - Man with yellow whistle in his mouth - paired with the photograph RKD - Same man with yellow filter cigarette, the same size of the whistle).

In the first stage of the picture selection process, three lay judges, smoking university students, evaluated independently the 63 pictures related to smoking behavior. They were instructed to choose and list the codes of the 20 photos they considered most related to smoking behavior, the first one being considered the most related to smoking behavior or causing the greatest urge to smoke, and so on. The 20 pictures with the greatest level of agreement among judges (the minimum degree was 67% of agreement, equivalent to at least two judges) concerning the requirement “provoking the urge to smoke” were selected.

In the second stage, one lay judge, a smoking university student, evaluated the 63 control pictures. He was instructed to choose and list the codes of 20 photos that he considered more appropriate to match the 20 pictures related to smoking behavior, which were selected in the first phase. The 20 pairs had a level of agreement of 100% with the previous selection criterion of pertinence.

Finally, an expert judge (non-smoker psychologist with clinical and research experience on drug dependence) evaluated the pertinence of the selected pictures. The expert judge had 100% agreement with the lay judge. From the 20 pairs of pictures, the 12 rated as more provocative of urge to smoke were selected (MacLeod et al., 1986). Regarding their complexity, the pictures could be considered simple or having no complexity. Maybe 3 of them (41-42, 101-102, 111-112) might require greater cognitive processing, but they could not be considered complex, since they don't include real-life scenes where the cigarette is used, such as parties and bars (Miller & Fillmore, 2010). Each pair was photographed against the same background, only changing the object – cigarette or control.

Evidence of Validity

The evidence of validity of the pictures was obtained from two studies. Study I was conducted in order to provide evidence of validity related to the content of the pictures (face validity). To this end, an online survey was conducted in which respondents were asked to assess whether or not the pictures were related to smoking behavior and how

much each of them was related to smoking behavior. Study II aimed to gather evidence of content validity of the smoking-related pictures used in a task to assess attentional bias. For this reason, smokers and non-smoker evaluated the pictures related to smoking concerning the relevance to smoking behavior and pleasantness. We also assessed whether smokers and non-smoker reported higher craving after completing this task.

Study I: Evidence of face validity

Method

This study was developed with the aim of gathering evidence of face validity for the 24 pictures developed for the study of cue reactivity, from which 12 pictures are related to smoking and 12 are matched control pictures. For this purpose, in Study I the participants judged if the 24 pictures were related to smoking behavior or not and how much each picture was related to this behavior.

Participants. The study included 540 volunteers ($M = 33$ years old, $SD = 11.7$), 70% female. From the total sample, 347 (64%) reported being non-smoker, 62 (11%) were former smokers and 131 (25%) smokers. From the latter, 95 (18%) were heavy smokers and 36 (6%) occasional smokers.

Materials and procedures. An online survey (Survey Monkey ®) with 51 questions in total was used. The mean response time was 10 minutes. The first question was simple choice and identified the condition of the participant in relation to smoking behavior. The statement was: “You are”, and the response options were: Smoker (you smoke at least one cigarette a day); Occasional Smoker (you smoked at least one cigarette in the last 30 days); Former smoker (you have stopped smoking for at least 6 months); Non-smoker (you never smoked regularly) (Halty et al., 2002; WHO, 2000). The second question was an open question regarding age, and the third was a dichotomous choice about gender (male or female). The remaining questions were presented with each of the 12 pictures related

to smoking behavior and the 12 control pictures: 24 closed questions in which the participant selected “Yes” or “No” to answer the question “Is this picture related to smoking behavior?”. Additionally, all pictures showed a 5-point rating scale (not at all, slightly, moderately, very much, extremely) as options to the question “How much is this picture related to smoking behavior?”

The sample was selected by convenience. The survey was sent via e-mail to the researchers’ contacts. The survey was sent along with an invitation for the contacts to forward the survey to their contacts. Thus, at this second moment the snowball sampling method was used (Biernacki & Waldorf, 1981).

The order of presentation of each pair of pictures was counterbalanced, that is, for half of the pairs the smoking-related picture was presented first with both questions and right after its matched control picture was shown with the questions. The other half of pictures followed the same procedure, but matched control pictures were shown first with the questions and right after their pairs. Pictures ending in 1, i.e. 11, 21, 31, 41, 51, 61, 71, 81, 91, 101, 111 and 121 were evaluated by the judges in this development process as related to smoking behavior, and the pictures ending in 2, i.e. 12, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112 and 122 were evaluated as unrelated.

Data analysis. The data were submitted to the procedures of descriptive statistics to characterize the sample and of multiple-frequency analysis to investigate whether the 12 cigarette pictures and the 12 matched control pictures would be assessed as related to smoking behavior. The analysis of mixed linear models was used to investigate how much each picture was related to smoking behavior and whether there would be group and/or picture type effect. The covariance matrix was chosen according to Akaike’s Information Criteria (AIC). The diagonal covariance matrix was used for the pairs 1, 3, 5, 7, 8, 11 and 12 and, for the other pairs, an unstructured covariance matrix was used. In these analyses the significance level of .05 was adopted, and the statistical software used was SPSS version 18.0.

Results. Regarding the assessment of 24 pictures (cigarette/control) as representative of smoking behavior or not, the multiple frequency analysis revealed that 94.2% of all participants answered that the cigarette pictures were related to smoking behavior; and 90.8% answered that the control pictures were not related to smoking behavior. The groups agreed on the evaluation of the pictures, as Table 1 shows.

Table 1.
Pictures analysis by group

Groups	Cigarette pictures		Control pictures	
	Related to smoking	Not related to smoking	Related to smoking	Not related to smoking
Non-smoker	94.7%	5.3%	9.2%	90.8%
Former Smoker	92.1%	7.9%	11.7%	88.3%
Occasional Smoker	92.0%	8.0%	10.3%	89.7%
Frequent Smoker	94.8%	5.2%	7.3%	92.7%

The assessment of how much each picture was related to smoking behavior enabled a classification of the pairs of pictures from the most related to cigarette to the least related. Table 2 shows how much each of the pictures and the respective pair were assessed as related to smoking behavior in terms of mean rating (0 = not at all, 1 = little, 2 = moderately, 3 = very much, 4 = extremely). The order of presentation follows the classification.

The analysis through linear mixed models allowed the evaluation of the effects of picture type (smoking or control), group (smoker, occasional smoker, former smoker and non-smoker) and the interaction between these two factors considering the responses given to each pair of pictures. As expected, there was significant difference between the cigarette pictures and their respective control pictures for all pairs. Pairs 3, 5, 6, 10 and 12 showed only picture type effect ($p < .001$). The pairs 2, 4, 8 and 11 showed no interaction effect, but there was group effect ($p < .01$) and picture effect ($p < .001$). In the pairs 2 and 8 there was significant difference between the groups of Smokers and Non-smokers ($p < .05$ and $p = .003$, respectively), and Non-smokers rated the pictures as more related to

Table 2.
Classification of how each picture was evaluated as related to smoking behavior

Order classification	Picture cigarette	Related to cigarette (yes)	How much related (mean)	Control picture	Related to cigarette (yes)	How much it is related (mean)
1 st	81	99.4%	3.87	82	1.9%	0.07
2 nd	21	98.8%	3.61	22	10.5%	0.33
3 rd	41	99.2%	3.43	42	33.2%	0.80
4 th	121	98.5%	3.43	122	5.5%	0.17
5 th	31	97.2%	3.06	32	3.6%	0.11
6 th	51	96.5%	3.03	52	3.7%	0.13
7 th	11	90.6%	2.96	12	6.6%	0.21
8 th	111	95.8%	2.92	112	3.4%	0.11
9 th	71	97.0%	2.82	72	3.6%	0.09
10 th	91	91.7%	2.55	92	15.3%	0.37
11 th	101	82.4%	2.10	102	19.1%	0.45
12 th	61	83.7%	1.95	62	4.2%	0.16

cigarette in comparison to Smokers in both cases. For the pair 4, there were significant differences between Smokers and Non-smokers ($p = .001$) and between Smokers and Occasional Smokers ($p = .03$); Smokers had lower mean rating scores in both cases. In pair 11, there was a significant difference between Occasional Smokers and Non-smokers ($p = .003$), and again Non-smokers rated the pictures as more related to smoking than Occasional Smokers.

Finally, effect of group X picture interaction was found for pairs 1 ($p < .001$), 7 ($p < .04$) and 9 ($p = .015$). In Pair 1, Non-smokers rated the smoking-related picture as more related to cigarette compared to other groups, while for Pair 7 Occasional Smokers had a lower mean rating score in the evaluation of the smoking-related picture when compared to the other groups. In Pair 9, Smokers and Non-smokers had higher mean rating score for the cigarette picture compared to Occasional Smokers and Former Smokers, while Former Smokers had a higher average in Control Picture if compared to the other groups.

Study II: Evidence of content validity

Method

Participants. This study included 97 university students, of whom 47 were smokers (36 women), mean age 23 years ($SD = 2.82$); and 50 non-smokers (including 37 women), mean age 21 years ($SD = 2.93$). Those who smoked at least one cigarette per day were considered smokers, and those who had never smoked regularly, non-smokers. As exclusion criteria for dependence on drugs other than tobacco, participants answered the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), translated from the original and validated in Brazil by Henrique, De Micheli, Lacerda, Lacerda, and Formigoni (2004). Other exclusion criteria were use of drugs acting on the central nervous system and presence of psychiatric diseases.

Materials. Visual probe task: Experimental attention task performed in the computer, originally developed by McLeod and colleagues (1986), and

adapted for smokers (as described in Producing matched pictures session). The task was programmed in the software E-prime to control the images' stimulus onset asynchrony (SOA) and record the responses (reaction time). On the computer screen, the pairs of pictures (95 mm length x 130 mm width each, with the distance between the inside edges of 30 mm) were presented in three different SOAs (200, 500 and 2000 ms), assessing the process of both initial and sustained attention.

Craving Scale: All participants rated the current level of their urge to smoke before and after the attentional bias task. The craving rating scale was answered through a scale from 0 to 9 (0 = no urge at all and 9 = extremely strong urge) corresponding to the numbers in the standard computer keyboard.

Pleasantness Scale: All participants evaluated the smoking-related pictures and their pairs concerning pleasantness through a scale of -3 (very unpleasant) to +3 (very pleasant).

Relevance Scale: All participants rated the relevance of each of the 12 smoking-related pictures in relation to their own smoking behavior using a scale from -3 (not relevant at all) to +3 (extremely relevant). This was later transformed into a positive scale from 1 to 7, for a better comprehension of the data.

For the evaluation scales of pleasantness and relevance of the pictures, the keyboard has been modified so that the letters Z, X, C, V, B, N and M have been replaced by the numbers -3, -2, -1, 0, +1, +2 and +3, respectively.

Procedures. The participants signed a consent form and then answered some questionnaires about their smoking behavior and performed the computer task, in alternating order. The experimental procedures of the visual probe task were similar to those proposed by Field and colleagues (2004).

To perform the Visual Probe Task, the participants read the instructions and answered the question: "How strong is your urge to smoke now?" through a scale from zero (none) to nine (extremely) in the standard keyboard. They were given ten practical trials performed in the tree SOA (200, 500 and 2000 milliseconds) as a training practice so that they could understand the task procedure.

Each trial started with a cross in the center of the screen (fixation point), shown for 500 milliseconds (ms). This cross was substituted by pairs of images shown side by side. Immediately after the exposure of these pairs, an arrow pointing up or down was displayed in the place of one of the images in the pair, which was kept until the response was given by the participant.

After the visual probe task, participants also assessed the degree of pleasantness/unpleasantness that the pictures brought and the relevance of these pictures for their own smoking behavior, as described. These scales were previously used by Field, Mogg and Bradley (2005) to assess evaluational bias (Field et al., 2004).

Both before and after the visual attention task, participants answered, using a scale from zero to nine, about their current level of urge to smoke, as previously described. They

Data analysis. For attentional bias data, reaction times shorter than 200ms or longer than 2000ms, or more than 3 standards deviations greater than the mean were excluded to eliminate outliers (3% of data). The calculation of attentional bias in visual probe task is a simple subtraction from the mean reaction time in the test when the arrow substitutes the target images from the mean reaction time when the arrow substitutes the control images (mean control RT – mean cigarette RT). Positive results indicate attentional bias to target images. A 2 X 3 design compared groups and SOAs in a general linear model. Another general linear model was used to compare groups and craving (initial and final) in a 2 X 2 design. Data on evaluation of pleasantness of smoking-related pictures and their pairs between groups were submitted to two-way analysis of variance. A one-way analysis of variance was used to compare the rating of the two groups on the relevance of smoking-related pictures to their own smoking behavior. All tests of significance were performed at $\alpha = .05$ using the statistical software used was SPSS version 13.0.

Results. Smokers showed attentional bias to the target images in all SOAs, while the non-smokers did not have this bias (Figure 1). There was a main

effect of group ($F(1,95) = 4.33, p = .040$), but not SOAs, and there was no interaction between these factors.

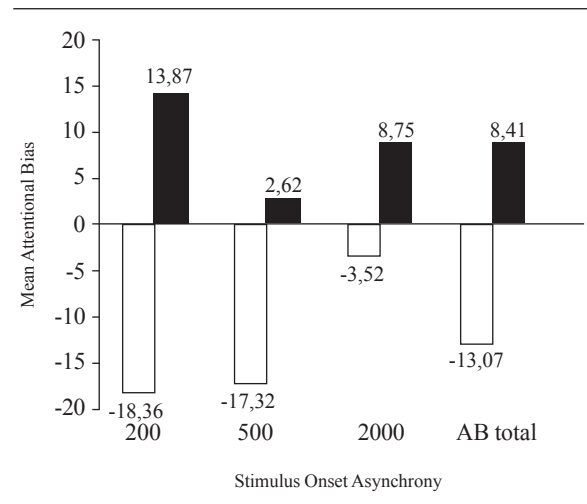


Figure 1. Mean attentional bias (AB) in non-smokers (open bars) and smokers (black bars) in each SOA (200, 500 and 2000ms) and in total.

The total craving rating was low (mean scores close to 2 in a 10-point scale). Still, smokers had a greater craving than non-smokers both before (smokers $M = 2.04, SD = 2.12$ / non-smokers $M = 0.91, SD = 1.57$) and after (smokers $M = 2.28, SD = 2.23$ / non-smokers $M = 1.08, SD = 1.88$) the visual probe task ($F(1,94) = 8.74, p < .05$). The final craving ($M = 1.67, SD = 2.13$) was higher than the initial ($M = 1.47, SD = 1.94$) in both groups.

Both smokers and non-smokers considered the control pictures as pleasant (smokers, $M = 1.04$; non-smokers, $M = 1.03$), and the smoking-related pictures were considered unpleasant (smokers, $M = -0.7$, non-smokers, $M = -1.28$). There were main effects of group ($F(1,94) = 17.47, p < .001$) and picture type ($F(1,94) = 83.7, p < .001$). Smokers rated the pictures related to cigarette as less unpleasant than the non-smokers, as evidenced by the interaction between picture type and group, $F(1,94) = 10.37, p < .05$.

Concerning the relevance of pictures to induce urge to smoke, the smokers evaluated the pictures as more relevant ($M = 4.06, SD = 1.78$) than the non-smokers ($M = 3.48, SD = 1.79$) ($F(1,93) = 14.86, p < .05$).

Discussion

Taken together, the results of this study contribute to provide evidence of face and content validity of 12 pictures related to smoking and 12 matched control pictures, and they also provide a full description of the pictures development process. This study paid special attention to pairing smoking-related pictures and their matched control pictures and all stimuli were evaluated by lay and expert judges. In addition, evidence of content and face validity of the pictures were gathered in order to minimize the problem of lack of standardization.

A study that investigated attentional bias in drinkers using two measures of attentional bias (visual probe task and eye-tracking) found attentional bias only in response to simple alcohol-related pictures and not to complex pictures, what highlights the importance of imagery in these tasks. These findings suggest that simple (alcoholic beverages, such as a can of beer) but not complex (real-life events involving alcohol such as bars and parties) alcohol-related pictures might be effective at capturing and holding one's attention. This is against the converse supposition that complex pictures could be more effective at capturing attention because they are more realistic representations of an individual's experience with alcohol (Miller & Fillmore, 2010). This is likely to be due to a higher cognitive processing required by complex pictures, which overshadows the alcohol-related aspect of the picture. Considering that, most of the pictures available in the present study are simple pictures, and the remaining ones have low complexity. Furthermore, the emotional content of the cigarette picture, determined by background, was paired with the control pictures, what provides a great advantage in the use of these pictures in future studies.

Regarding the process of face validity, as expected, smoking-related pictures and control pictures were correctly identified by over 90% of participants. According to the data presented in Table 2, Pair 8 had the highest rate of correct identifications, while Pair 11 showed the greatest difference. Of the participants, 82.4% considered the smoking-related picture related to smoking behavior, while 19.1% evaluated the control picture as related to

this behavior. However, in assessing how much each picture is related to smoking behavior, the differences in mean rating scores were significant for all pairs, showing that smoking-related pictures are valid representatives of the smoking behavior if compared to their respective controls. The 12 pairs of pictures can be considered valid for the task of attentional bias, since all the groups considered the smoking-related and control pictures that form each pair as significantly different in relation to the smoking behavior. The analysis of mixed linear models also indicated significant differences for all pairs of pictures in the evaluation of how much each picture was related to the smoking behavior.

Regarding the attentional bias evaluation in Study II, the fact that these smokers showed an attentional bias to the smoking-related pictures in comparison with the non-smokers, who did not show this bias, is consistent with the literature (Bradley et al., 2004; Ehrman et al., 2002; Mogg et al., 2003). This result gives support to the content validity of the 12 pairs of pictures used.

The craving scale administered before and after the visual probe task in Study II showed an increase of craving in both smokers and non-smokers after being exposed to the task. A limitation of this study is that smokers were not requested to abstain from smoking before attending the laboratory. This might explain the low craving scores before and after the task. Nevertheless, such results show that mere virtual exposure to smoking-related pictures increased the craving of smokers and, interestingly, of the non-smokers as well. Previous studies have shown that both in vivo cues associated with the consumption of cigarettes and smoking-related pictures attract the attention of the smoker and are able to generate or increase craving (Carter & Tiffany, 1999; Field & Cox, 2008). The results of the Craving Scale indicated that the pictures presented are valid representatives of the smoking behavior. Likewise, the fact that smokers consider smoking-related pictures relevant to their smoking behavior indicates that these pictures are validly representing this behavior.

Regarding the pleasantness scale administered in Study II, smokers and non-smokers considered the smoking-related pictures as more unpleasant

compared to control pictures. The method used was self-report assessment; therefore, it was vulnerable to the influence of social desirability. For this reason, it should be considered that this result may be related to the numerous campaigns carried out in Brazil which show the harmful effects of smoking. However, smokers still considered the cigarette pictures less unpleasant compared to non-smokers, which could be considered similar to the results of Field and colleagues (2004). Given the reinforcing nature of smoking-related stimuli to the smoking habit, it is understood that the fact that smokers considered the cigarette pictures less unpleasant when compared to non-smokers indicates that these pictures are valid representatives of smoking behavior.

Another limitation of this study is related to the homogeneity of the sample used in the second Study, which was composed of a population formed only by university students. Future studies may be performed to investigate whether the results remain similar if different age, education and cultural groups are analyzed. Finally, specifically in the Relevance Scale, it was not collected data on the relevance of control pictures to the smoking behavior. These data would allow the comparison of the relevance of each cigarette picture with its control picture, to confirm the validity of the smoking-related pictures.

The twelve pairs of pictures will be available for use in future studies on cue reactivity with smokers, in clinical practice as a technique of exposure and response, prevention and modification of attentional bias as a complementary technique in the smoking treatment.

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Fecha de recepción: 22 de diciembre de 2011
Fecha de aceptación: 23 de mayo de 2012

Supplementary material

