



# Adapting a computer-based smoking prevention program to Latin American adolescents

## Adaptación del programa computarizado para la prevención del tabaquismo en Latinoamérica

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**ABSTRACT. Objective:** Development of a linguistically advanced and culturally appropriate Spanish version of ASPIRE (A Smoking Prevention Interactive Experience) and its evaluation among school-age children from Colombia and Mexico was performed. **Material and methods:** The current study sought to employ a structured adaptation approach in the development of an improved Spanish version of ASPIRE, which is an online, interactive multimedia program designed for middle and high school students that has shown success in decreasing smoking initiation. **Results:** For the overall sample, the mean value for the pretest knowledge score before accessing ASPIRE was 62.5 ( $\pm$  10.33), while the mean value for the post-test score after completing the multimedia program was 77.5 ( $\pm$  15.42). **Conclusions:** Following edits and changes to the Spanish script based on expert comments we were able to further elaborate culturally appropriate content during the youth focus groups. This «bottom-up» approach provided meaningful input from the targeted adolescents themselves.

**Keywords:** Cessation program, Latin America, smoking, teenagers.

**RESUMEN. Objetivo:** Se desarrolló una versión en español y culturalmente adaptada de ASPIRE (una experiencia interactiva de prevención del tabaquismo) y su evaluación en niños en edad escolar de Colombia y de México. **Material y métodos:** El estudio actual buscó emplear un enfoque de adaptación estructurada de un programa multimedia interactivo en línea, diseñado para estudiantes en los Estados Unidos. Éste ha demostrado tener éxito en retrasar el comienzo de fumar. **Resultados:** Para la muestra general, el promedio para el puntaje de conocimiento previo a la prueba antes de acceder a ASPIRE fue 62.5 ( $\pm$  10.33), mientras que el promedio para el puntaje posterior a la prueba después de completar el programa multimedia fue 77.5 ( $\pm$  15.42). **Conclusiones:** Tras las ediciones en el guion en español basados en comentarios de expertos, pudimos elaborar un contenido culturalmente apropiado. Este enfoque proporcionó aportes significativos de los propios adolescentes seleccionados.

**Palabras clave:** Programa de cesación, Latinoamérica, fumar, adolescentes.

## INTRODUCTION

Tobacco use is the leading global cause of preventable death. Nearly 6 million deaths per year are attributable to tobacco use.<sup>1</sup> By 2030, that figure is likely to increase to more than 8 million deaths a year. Alarming, tobacco use often begins well before the age of 18. This represents a significant public health concern for low- and middle- income countries, where nearly 80% of the world's more than 1 billion smokers live.<sup>2</sup>

Findings from the 2000-2007 Global Youth Tobacco Survey (GYTS)<sup>3</sup> for students aged 13 to 15 years showed that the countries in the American Region with the highest prevalence of cigarette consumption were Colombia (57%) and Mexico (43%), with higher rates among female (Colombia, 59%; Mexico, 43%) than male adolescents (Colombia, 56%; Mexico, 42%). While the daily smoking prevalence among children in these countries decreased in 2013, according to the Tobacco Atlas report, more children smoke cigarettes on average in Colombia (12% of boys, 8% of girls) and Mexico (16% of boys, 13% of girls) than in other middle-income countries.<sup>4</sup>

For tobacco control programs to achieve greater impact in the youth population, interventions that prevent smoking initiation in children and adolescents must be implemented. It is thus important to create appealing, technology-based

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educational programs that promote smoking prevention and cessation as early as possible in the teenage years.

ASPIRE: A Smoking Prevention Interactive Experience, is a computer-based program in which children and adolescents have access to didactic and up-to-date information focused on smoking prevention and cessation.<sup>5</sup> The 5-module program features individualized assessment and tailored feedback on critical determinants of smoking behavior (i.e., readiness to quit or start smoking and susceptibility to smoking); an animated coach in the form of an older, experienced peer, who provides guidance to the learner on his/her journey to cessation; numerous interactive games that cognitively challenge the learner regarding critical management concepts; richly drafted and executed animations that, using a cast of characters, simultaneously excite, educate, and entertain; and approximately 2 hours of high-quality video featuring peer opinions, expert facts, and modeled real-life scenarios.

The ASPIRE program is guided by the Transtheoretical Model of Change (TTM) and the PRECEDE program planning model.<sup>5</sup> The evidence base for ASPIRE was first established in a nested cohort, group-randomized controlled trial. It compared the effect of ASPIRE versus the effect of a standard-care smoking cessation booklet. The sample was comprised of 1,160 participants (1,098 nonsmokers and 62 smokers at baseline) recruited from 16 inner city high schools in Houston, Texas where the majority were Hispanic (58.9%). For nonsmokers at baseline, smoking initiation rates were significantly lower among participants in the ASPIRE intervention condition at 18-month follow-up (1.9% versus 5.9%,  $p < 0.05$ ). A significantly higher decisional balance about not smoking and decreased temptations to smoke was found among ASPIRE participants. With respect to smoking cessation, a non-significant trend toward increased levels of smoking cessation was found among ASPIRE intervention participants, however since few smokers were recruited, this precluded conclusions with respect to cessation.<sup>6</sup> Findings were also validated in a group-randomized trial conducted in 16 high schools in Romania ( $n = 1,369$ ). Nonsmokers in this country who were randomized to the ASPIRE intervention were 35% less likely to report initiating smoking at 6-month follow-up than controls (OR = 0.65, 95% CI: 0.44-0.97).<sup>7,8</sup> Additional noteworthy indicators of ASPIRE effectiveness are the favorably reviews by Cochrane<sup>9</sup> and the National Cancer Institute (NCI), leading to ASPIRE being placed in the database of NCI Research-Tested Intervention Programs.<sup>10</sup>

While findings are promising for web-based behavioral interventions for smoking prevention among school-age children in the United States (US) and other developed nations,<sup>11-18</sup> similar innovative and effective interventions are nonexistent for Spanish-speaking children and adolescents in the Latin American region, an important public health

gap. Although the ASPIRE program has a Spanish version, it was developed for Hispanic/Latino children and adolescents living in the US and thus used a Spanish dialect with anglicisms that are not well understood across Latin America. The objective of this mixed-method study is to develop and test a new Spanish version of an evidence-based computer-based program for smoking prevention and cessation culturally adapted to Colombian and Mexican school-age children.

## MATERIAL AND METHODS

This was a multi-country pilot study led by research teams based at The University of Texas MD Anderson Cancer Center (MD Anderson) in Houston, United States; the *Instituto de Cancerología Las Américas* (IDC) in Medellín, Colombia; as well as the *Instituto Nacional de Cancerología* (INCan) and *Instituto Nacional de Enfermedades Respiratorias* (INER) in Mexico City, Mexico. Development of a linguistically advanced and culturally appropriate Spanish version of ASPIRE and its evaluation among school-age children from Colombia and Mexico was performed in two phases. Phase 1 aimed to improve the translation and revise the content for linguistic and cultural appropriateness, then record new dubbings (voiceovers) and change the subtitle text. In Phase 2, we tested the new version to determine its effectiveness. The portions of the study involving children and adolescents were approved by the local institutions' ethics boards: MD Anderson Protocol #2015-0330; IDC Protocol # 07-2015-I; and INCan Protocol # 015/044/DII, CEI/1022.

**Phase 1:** The subtitles of the original Spanish version of ASPIRE were imported using a script file and reviewed by a task force of 2 tobacco specialists and 2 public health professionals from Colombia, México, and Venezuela, who revised the script texts as needed in order to gain consensus on the grammatical constructions and use of Standard Spanish. The goal of this task force was to improve the subtitle language by excluding local terminology and certain verb tenses, assuring the accuracy and meaningfulness of the subtitle translation for a greater number of children across Spanish-speaking Latin America.

Additionally, a qualitative approach was conducted in which adolescents enrolled at five public schools in Medellín, Colombia, were exposed to the original Spanish version of ASPIRE and participated in five focus groups. The goal was to have teens', not just adults', perceptions on the changes and adaptation needed for the subtitles and dubbings of the new Spanish version of ASPIRE. The inclusion criteria for adolescents participating in this qualitative activity were: a) Being a resident of Medellín, Colombia; b) Ages 11 to 18 years; c) Currently attending middle school; d) Able to read and speak Spanish; and e)

Able to provide student assent, as well as parental consent. Recruited study participants were asked to complete the ASPIRE program, available for use in the computer lab located on each school campus. Since ASPIRE is organized into five modules that can take up to four hours in total to complete, in the interest of making the research activity less burdensome for the study participants, the adolescents assigned to each focus group were asked to only complete two of the five ASPIRE modules. *Figure 1* depicts the strategy used.

After reviewing the two assigned ASPIRE modules, study participants were invited to participate in a focus group to discuss their understanding of the content, program acceptability, and motivational appeal of the modules. Each of the focus groups was made up of 10 students, for a total of 50 students, and the discussions lasted 60 to 90 minutes depending on the flow of the conversation. The focus groups were led by qualified public health professionals who probed to learn about what students liked and did not like about the original Spanish version of ASPIRE (*Figure 1*).

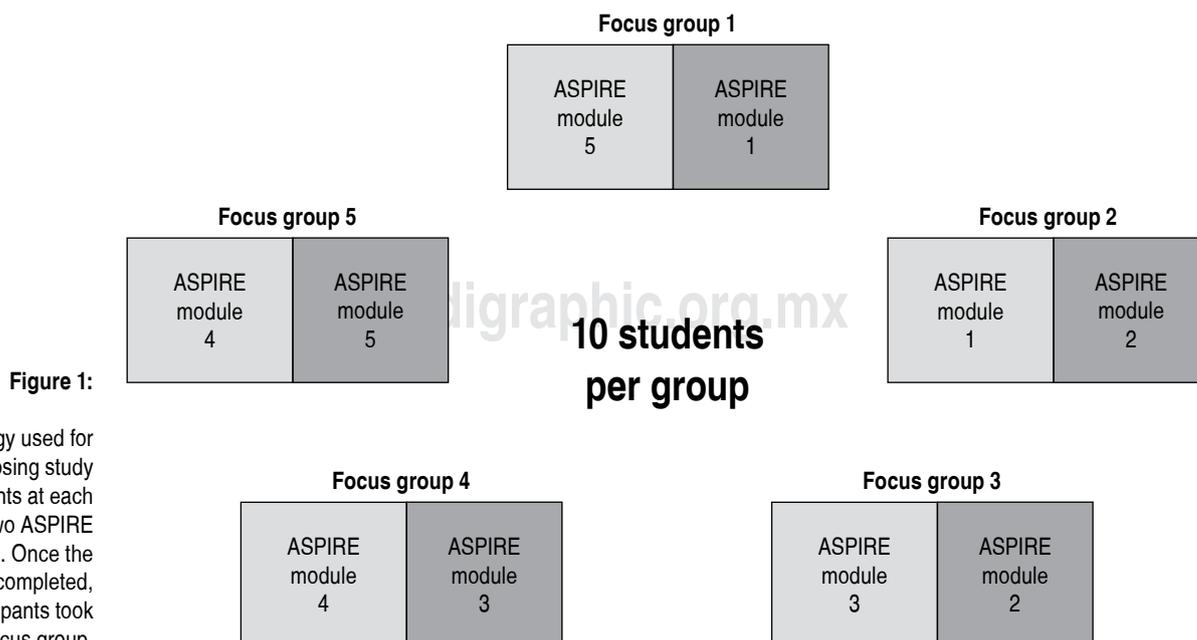
Focus group discussions were audio-recorded and transcribed. No personal information was retained on the transcriptions. Thematic and narrative analyses were conducted using the transcriptions to gain an understanding of how adolescents perceived the original Spanish version of ASPIRE. Narrative analysis calls for coding of the content and process. We used a constant comparative method to produce a thematic analysis of the transcribed data.<sup>19</sup> This reductive and interpretative method facilitated our ability to identify themes that represented recurring patterns of perception, acceptability, and meaning. As needed, we

specified and added concepts that emerged from the data. Once this step was completed, investigators discussed findings, resolved inconsistencies, refined the themes, and made thematic judgments. This qualitative analysis provided guidance for modifying the multimedia program. The Assessment, Intervention and Measurement (AIM) Facility, an in-house resource at MD Anderson assisted with changing subtitles and dubbing segments of ASPIRE according to the linguistic/cultural recommendations made by the study participants.

**Phase 2:** During the second phase, we pilot-tested the new Spanish version of ASPIRE among 149 Colombian and 45 Mexican children enrolled in 3 middle schools (1 school in Colombia and 2 in Mexico) using a pre-/post-test design. The inclusion criteria for participating in this research activity were the same as in Phase 1, except participants were residents of Medellin, Colombia, or Mexico City, Mexico. Phase 1 participants were excluded from Phase 2 to avoid response bias in our findings.

After obtaining study participants' assent and parental consent, children completed the new Spanish version of ASPIRE. The ASPIRE web-based program automatically directs participants to complete a pretest upon initiation of the program and a post-test, with the same battery of questions, on completion of the program. These program-generated pre- and post-tests included knowledge questions that were based on the content of the five ASPIRE modules.

The main outcome of interest was the comparison of knowledge scores, computed from the ASPIRE knowledge questionnaires (pre- and post-tests). Paired t-test and



two-sample t-test were used to test differences between pretest and post-test knowledge scores across the whole sample, as well as the difference in increase between the two countries.

## RESULTS

**Phase 1:** During the first phase, the task force of tobacco specialists and public health professionals identified a significant number of Anglicisms in the scripts of the original Spanish version of ASPIRE. For example, the term «water pipe» was changed to «*pipa de agua*» and «*narguila*», as these are used interchangeably in Latin America. The word «habit» (in Spanish, «*hábito*») was avoided when referring to smoking, since it has a mild connotation among Spanish speakers and does not convey that smoking truly represents an addiction. The task force also secured the inclusion of inverted question and exclamation marks, as well as accented letters that exist in the Spanish language, in all the subtitle texts. Additionally, words more commonly used in dialects of Mexican Spanish were changed to Standard Spanish.

Analysis of the transcripts generated during the focus groups provided additional feedback. In terms of the overall impression of the program, study participants liked the information on tobacco products and tobacco's health effects, as well as learning about tobacco prevention and cessation. Some participants stated they liked the video testimonials and interviews because they could relate to and learn from them. For example:

*«I liked it because it informed you a lot about what the cigarette can do, and [can be] prevent[ed] in many ways».*

However, participants also reported they disliked several aspects of ASPIRE, more specifically the culturally inappropriate Spanish language in some images and videos. In addition, some participants commented that the subtitles were hard to read:

*«... what I also didn't like was that the subtitles were too fast, so there was no time to read [them all]».*

Based on this feedback, the length of subtitles was shortened in order to allow more time for them to be displayed so that the viewers could finish reading them before they disappeared.

In terms of language barrier, most of the children participating in the focus groups reported inaccuracy in the translation of the subtitles and dubbings.

*«... the translations weren't cool because there were things you didn't understand. Even though it was in Spanish but I didn't understand the words».*

The indications given by the study participants assisted the task force in changing to standard Spanish many sections within the ASPIRE modules in order to reach a wider audience among Spanish-speakers in Latin America. When participants were asked whether ASPIRE would be effective in helping other teens in Colombia and Mexico live a tobacco-free life, a considerable number of them responded affirmatively. For example:

*«... it helps us those who have not yet started smoking, but also those who are already smoking because they see other people's stories...».*

*«I thought the program was very interesting because it teaches us that consuming tobacco can kill us, give us gray hair, wrinkles...it may make us sterile».*

*«... the text is very clear when it explains each and every one [of the tobacco products]. It says there, 'side effects' and they all have side effects».*

**Phase 2:** Forty-five school-age kids from Mexico (2 schools) and 149 from Colombia (1 school) tested the revised Spanish version of ASPIRE. The mean age was 14 years ( $\pm 1.61$ ). Ninety were male and 104 were female. Seventy-two percent of the study participants were enrolled in 7th, 8th, or 9th grade.

For the overall sample, the mean value for the pretest knowledge score before accessing ASPIRE was 62.5 ( $\pm 10.33$ ), while the mean value for the post-test score after completing the multimedia program was 77.5 ( $\pm 15.42$ ). The paired-samples t-test showed 15 points ( $\pm 1.07$ ) difference between the pretest and post-test scores across all the 194 study participants, with statistical significance at a level of  $p < 0.001$ , indicating an increase in knowledge after the study participants were exposed to ASPIRE.

To determine whether the increase in knowledge varied between countries, the difference between the pretest and post-test knowledge scores was computed for each country, becoming the dependent variable for the purpose of this analysis. According to the two-sample t-test results, the difference of the increase in knowledge scores between Colombia and México is 4.8 ( $\pm 2.53$ ) with Colombia having a larger increase compared to México. However, the difference observed between these two countries is not statistically significant at the 0.05 level ( $p = 0.059$ ).

## DISCUSSION

We conducted a mixed-method pilot study aiming at adapting and testing a newer Spanish version of ASPIRE, an evidence-based interactive multimedia tobacco prevention and cessation program for youth in Colombia and Mexico. The project provided us with important indications on how

to make mature, highly appealing educational programs, like ASPIRE, more impactful in countries throughout Latin America for reducing tobacco use among Spanish-speaking youth. Even though more children smoke cigarettes on average in Colombia (12% of boys, 8% of girls) and Mexico (16% of boys, 13% of girls) than in other middle-income countries, interactive smoking prevention programs specifically designed for adolescents and youth are scarce in these countries.

For the past two decades, reports from industrialized countries have shown that Internet-based interventions are a powerful approach among adolescents and youth for preventing the initiation of tobacco use and controlling smoking behaviors.<sup>11-18</sup> Similar web-based programs as those available in English for educating youth about nicotine addiction and the dangers of smoking are lacking for Latin American youth. One approach for reducing health disparities is to linguistically and culturally adapt original evidence-based behavioral interventions that can reach distinct cultural groups.<sup>20</sup>

The current study sought to employ a structured adaptation approach in the development of an improved Spanish version of ASPIRE, which is an online, interactive multimedia program designed for middle and high school students in the US that has shown success in delaying smoking initiation.<sup>6</sup> Following edits and changes to the Spanish script based on expert comments (a «top-down» approach), we were able to further elaborate culturally appropriate content during the youth focus groups. This «bottom-up» approach provided meaningful input from the targeted adolescents themselves.

In addition to the aforementioned qualitative approach, a quantitative pilot study was conducted to determine whether the cultural adaptation in the improved Spanish version of ASPIRE was successful for communicating the program content to Colombian and Mexican youth. We observed a statistically significant increase in knowledge following the intervention ( $p < 0.001$ ). The fact that there was no significant statistical difference observed between the pretest and post-test knowledge scores in Colombia compared to Mexico ( $p < 0.07$ ) indicated that the new Spanish version of ASPIRE was equally understood and accepted by study participants from each of these two countries.

There are limitations to the current study. First, the adaptations of the newer Spanish version of ASPIRE may not be fully accepted by all Spanish-speaking Latin American countries, as Spanish has multiple national and regional standards that very frequently differ in pronunciation, word choice, and meaning. Second, the study design used in Phase 2 only included a small sample of school-age children from two Latin American cities, Medellín (Colombia) and México City (México). While this approach ensured access to two different Hispanic perspectives, there may be some

unique input we were unable to receive from, for example, youth from Central American or Southern Cone countries. Thus, the efficacy of the revised Spanish version of ASPIRE should be tested through a randomized control trial with diverse adolescents and teens across Latin América. In conclusion, data collected from this pilot study in Colombia and México provided an initial assessment of the new Spanish version of the ASPIRE program, which provides an accessible, potentially cost-effective, and culturally acceptable option for Latin American adolescents to prevent tobacco use initiation and control smoking behavior.

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## REFERENCES

1. WHO. *WHO Report on the Global Tobacco Epidemic, 2017: monitoring tobacco use and prevention policies*. Geneva: World Health Organization; 2017.
2. Murthy P, Mishra S. *Tobacco use in pregnancy-global evidence and relevance to LMIC*. *J Subst Abuse Alcohol* 2017;5(4):1069.
3. Warren CW, Jones NR, Peruga A, Chauvin J, Baptiste JP, Costa de Silva V, et al. *Global youth tobacco surveillance, 2000-2007*. *MMWR Surveill Summ* 2008;57(1):1-28.
4. *The Tobacco Atlas: World Lung Foundation*. 6th ed. USA: Vital Strategies; 2018. p. 1-57.
5. Prokhorov AV, Kelder SH, Shegog R, Conroy JL, Murray N, Peters R, et al. *Project ASPIRE: an Interactive, Multimedia Smoking Prevention and Cessation curriculum for culturally diverse high school students*. *Subst Use Misuse* 2010;45(6):983-1006. doi: 10.3109/10826080903038050.
6. Prokhorov AV, Kelder SH, Shegog R, Murray N, Peters R Jr., Agurcia-Parker C, et al. *Impact of A Smoking Prevention Interactive Experience (ASPIRE), an interactive, multimedia smoking prevention and cessation curriculum for culturally diverse high-school students*. *Nicotine Tob Res* 2008;10(9):1477-1485. doi: 10.1080/14622200802323183.
7. Prokhorov AV, Marani SK, Calabro KS, Ford KH. *Theory-and technology-driven educational curricula addressing tobacco use*.

- Procedia-Social and Behavioral Sciences 2012;46:4504-4507. <https://doi.org/10.1016/j.sbspro.2012.06.285>
8. Thomas RE, McLellan J, Perera R. *School-based programmes for preventing smoking*. Cochrane Database Syst Rev. 2013;(4):CD001293. doi: 10.1002/14651858.CD001293.pub3.
  9. Research-Tested Intervention Programs. *A smoking prevention experience ASPIRE*. National Cancer Institute; 2008 [Access date: 2018 May]. Available from: <http://rtips.cancer.gov/rtips/programDetails.do?programId=2440327>.
  10. N d şan V, Foley KL, Pénczes M, Paulik E, Mih icuţ Ş, Ábrám Z, et al. *The short-term effects of ASPIRA: a web-based, multimedia smoking prevention program for adolescents in Romania: a cluster randomized trial*. Nicotine Tob Res 2017;19(8):908-915. doi: 10.1093/ntr/ntw308.
  11. Cremers HP, Mercken L, Candel M, de Vries H, Oenema A. *A web-based, computer-tailored smoking prevention program to prevent children from starting to smoke after transferring to secondary school: randomized controlled trial*. J Med Internet Res 2015;17(3):e59. doi: 10.2196/jmir.3794.
  12. Jander A, Crutzen R, Mercken L, Candel M, de Vries H. *Effects of a web-based computer-tailored game to reduce binge drinking among dutch adolescents: a cluster randomized controlled trial*. J Med Internet Res 2016;18(2):e29. doi: 10.2196/jmir.4708.
  13. Shegog R, McAlister AL, Hu S, Ford KC, Meshack AF, Peters RJ. *Use of interactive health communication to affect smoking intentions in middle school students: a pilot test of the «Headbutt» risk assessment program*. Am J Health Promot 2005;19(5):334-338. doi: 10.4278/0890-1171-19.5.334.
  14. Norman CD, Maley O, Li X, Skinner HA. *Using the internet to assist smoking prevention and cessation in schools: a randomized, controlled trial*. Health Psychol 2008;27(6):799-810. doi: 10.1037/a0013105.
  15. Taylor GMJ, Dalili MN, Semwal M, Civljak M, Sheikh A, Car J. *Internet-based interventions for smoking cessation*. Cochrane Database Syst Rev 2017;9:CD007078. doi: 10.1002/14651858.CD007078.pub5.
  16. Bannink R, Broeren S, Joosten-van Zwanenburg E, van As E, van de Looij-Jansen P, Raat H. *Effectiveness of a Web-based tailored intervention (E-health4Uth) and consultation to promote adolescents' health: randomized controlled trial*. J Med Internet Res 2014;16(5):e143. doi: 10.2196/jmir.3163.
  17. Woodruff SI, Conway TL, Edwards CC, Elliott SP, Crittenden J. *Evaluation of an Internet virtual world chat room for adolescent smoking cessation*. Addict Behav 2007;32(9):1769-1786. doi: 10.1016/j.addbeh.2006.12.008.
  18. Buller DB, Borland R, Woodall WG, Hall JR, Hines JM, Burris-Woodall P, et al. *Randomized trials on consider this, a tailored, internet-delivered smoking prevention program for adolescents*. Health Educ Behav 2008;35(2):260-281. doi: 10.1177/1090198106288982.
  19. Glaser B, Strauss A. *The discovery of grounded theory: strategies for qualitative research*. Rutgers: Transaction; 1999.
  20. Barrera M Jr, Castro FG, Strycker LA, Toobert DJ. *Cultural adaptations of behavioral health interventions: a progress report*. J Consult Clin Psychol 2013;81(2):196-205. doi: 10.1037/a0027085.

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