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Development and Validation of An Evaluation Scale for Audiovisual Production for Health Interventions - ZIKAMOB

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Abstract

According to the World Health Organization, intervention actions and Health Education achieve better performance when based on Behavior Change Theories associated with new technologies. This work aimed to build and validate an Audiovisual Production Assessment Scale (APAS) for use in educational interventions. One hundred videos of up to 90 seconds in length, produced by high school students from Northeast Brazil, were analyzed. The APAS contains twenty statements, grouped into five sections, some of which are based on the Social Cognitive Theory (observational learning; facilitators) and others, such as the halo effect and cognitive comfort, were proposed by Daniel Kahneman. It was found that, of the twenty statements, 15 of them had no significant difference between different evaluators; having obtained a value of 0.941 for Cronbach's Alpha, showing excellent internal reliability of the APAS. On average, 22 (33.8%) videos received a score greater than 60 points, indicating that they have the potential to significantly contribute to population behavior change in relation to the prevention of mosquito-borne arboviruses; 28 (41.3%) contribute satisfactorily; 15 (22.9%), partially and from one to two videos were scored with values lower than 19 points. Altogether, 12% of the videos received maximum scores in relation to the total score and subjective score. The APAS is, therefore, an example of an effective tool for assessing audiovisual content that can be used in educational interventions in health, with good internal reliability. The scale allows evaluating any content, classifying the production into categories that reveal its potential to promote behavior change.

Keywords: arboviruses, health education, theories of behavior change, video analysis

1. Introduction

The rapid spread of mosquito-borne arboviruses that cause dengue, Zika and chikungunya is one of the most serious Public Health challenges today (Patterson, 2016). In Brazil, the number of people affected by these arboviruses has increased considerably in recent years. It is estimated that one million cases of dengue occurred each year, from 2010 to 2016, which resulted in hundreds of deaths. This situation was aggravated with the introduction of Zika and Chikungunya viruses in mid-2015 (Villabona-Arenas et al., 2014; Zanotto & Leite, 2018), which created a sanitary emergency situation in Brazil and in the world (WHO, 2016). Between 2017 and 2018, 171,582 potential cases of dengue, 53,089 of chikungunya and 5,401 of Zika virus disease were recorded (Gonçalves et al., 2015; Brasil, 2018). The high prevalence of cases is associated with socioeconomic and environmental factors, in addition to increasing urbanization and lack of basic sanitation, contributing to the proliferation of the vector of these diseases: the *Aedes aegypti* mosquito (Gonçalves et al., 2015; Lima-Camara, 2016).

Vector control programs have developed actions to prevent and eliminate breeding sites, mainly with the use of larvicides (Araújo, 2015); however, this procedure has contributed to the selection of resistant strains of vector

mosquitoes (Ali et al., 2017). On the other hand, the engagement of the population as an active agent in vector control has been reported by studies as an efficient intervention strategy, since most breeding sites are located in anthropic environments, where there is a high concentration of population and residences (Lima, Goulart & Neto, 2015; Lima-Camara, Urbinatti, & Chiaravalloti-Neto, 2016; Zara et al., 2016; Carvalho et al., 2017). The engagement of the population, through educational actions, has been prioritized in vector control policies with the use of mass media, such as open television, and the development of applications, such as Zikazero, to facilitate the population's reporting of breeding sites (Reiner et al., 2016; De Souza Silva et al., 2018); however, to date, no studies have been reported to assess the impacts of these actions.

According to the World Health Organization (WHO), intervention and Health Education actions achieve better performance when based on theories of behavior change (World Health Organization, 2012). These theories are organized into theoretical constructs that explain the factors that influence behavior change. Thus, choosing a context-appropriate theory can favor the success of the intervention, as it facilitates the identification of essential elements that contribute to behavior change (Michie, Stralen, & West, 2011; Gainforth, West, & Michie, 2015). Some of the behavior change theories most frequently reported in the literature are: Rational Choice Theory (RCT) and Theory of Planned Behavior (TPB); Social Cognitive Theory (SCT), Transtheoretical Model (TTM) and Health Belief Model (HBM) (World Health Organization, 2012; Gainforth, West, & Michie, 2015).

The Social Cognitive Theory (SCT) was proposed by Bandura in 1986. It advocates that human behavior is the result of the interaction of personal and cognitive, behavioral and environmental factors. SCT considers observation and imitation as fundamentals of the change process, which is also influenced by self-efficacy, self-regulation and outcome expectations (Bandura, Azzi, & Polydoro, 2008). According to Bandura (2004), social cognitive theory specifies a central set of determinants, the mechanism by which they interact and the ideal ways to translate this knowledge into effective health practices. Environmental and social factors reciprocally influence individual and collective behavior (reciprocal determinism); and change occurs more easily if the person or population believes that they are capable of changing their behavior (self-efficacy or collective efficacy). Behavior change can be stimulated by observing and imitating other people performing the target behavior, by incentives or rewards, by facilitating factors and by moral encouragement. Goals and outcome expectations also affect the likelihood that a person will change their behavior (Glanz, Rimer & Viswanath, 2008; World Health Organization, 2012). Studies demonstrate the effectiveness of the Social Cognitive Theory in experiments involving health promotion and intervention actions (Tripp et al., 2000; Lennon, 2007; Webb et al., 2010).

Behavior change theories have been associated with new information and communication technologies (ICT) and the use of social media to carry out health interventions (World Health Organization, 2016). Mangueira et al. (2019) used the concept of mobile learning to conduct a study on beliefs and behaviors related to arbovirus prevention in northeastern Brazil. Participants were given tasks to perform through the production of videos, published on social media, in order to publicize the performance of prevention actions. They find evidence that the use of interventions using mobile devices can contribute to behavior change. In this intervention, the participants produced audiovisual content (videos) disseminated through social networks (Mangueira et al., 2019). The use of videos as a health promotion strategy is frequent in intervention studies (Tuong, Larsen, & Armstrong, 2014; Arnaliwati, 2019). However, there is a gap in the literature regarding the validation of audiovisual content assessment strategies (videos), such as cards or assessment scales, that can be used in different contexts to indicate the levers and factors that can contribute to a population's behavioral change.

This work aimed to develop and validate a scale for assessing audiovisual production (videos) that can be used in educational interventions based on behavior change theories. We sought to answer the following questions: How reliable is the tool? Does scale facilitate the identification of producing videos with the greatest potential to stimulate behavior change? What advantages and limitations can be seen for its use in educational interventions for health promotion and disease prevention?

2. Methods

2.1 Study Design and Sample

This is an exploratory descriptive study through which the Audiovisual Production Assessment Scale (APAS) was developed for educational interventions based on theories of behavior change. This scale was used to evaluate videos of an educational intervention, and the results of the validation process are described in this work. In all, 100 videos produced by high school students participating in an educational intervention for the prevention of arboviruses – ZikaMob, which lasted three months - were evaluated.

2.2 Intervention Description

The ZikaMob project, “Impact of mobile learning on the prevention and management of complications caused by arboviruses (Zika, Dengue, Chikungunya) - ZIKAMOB”, was funded by the British Council and the Research Support Foundation of the State of Paraíba (FAPESQ). The educational intervention consisted of holding a competition between high schools, with the objective of complying with the greatest possible number of actions

(online "missions" on social media) to prevent mosquito-borne arboviruses. To prove the accomplishment of the mission, the student had to produce a video of at most 90 seconds, using mobile devices (cell phones). Then the videos were posted on Facebook and other social networks such as Twitter and Instagram. These posts needed to be in public mode so that users of these networks could view them. The video links were included in the ZikaMob virtual platform, developed with the purpose of counting likes, interactions and sharing of each student's video. The sum of the scores of the completed tasks, including questionnaires answered directly on the ZikaMob platform, were used to compose the students' scores and also the total number of participating schools (Santos et al., 2022).

During the intervention, five video missions were carried out over a period of three months. In mission 1, students produced videos inviting the population to follow the ZikaMob project page on Facebook. This mission, however, was not included in this analysis because it was not intended to change behaviors to prevent arboviruses. Mission 2 consisted of inspecting the house and yard, so that possible breeding sites for the mosquito were identified and eliminated. In mission 3, students were to separate recyclable materials and use the "Cataki" application to donate these materials to collectors. This increased the number of recyclables donated to waste pickers, increasing their income and reducing potential mosquito breeding sites. Missions 4 and 5 consisted of covering the windows and carrying out a cleaning effort, respectively, preventing the entry of mosquitoes into homes and their proliferation. For more on this project, and its successes, see Policarpo Cavalcante et al. (2020) and Santos et. al. (2022).

In all, 100 videos were analyzed: 27 referring to mission 2; 12 about mission 3; 52 of mission 4; and nine from mission 5. All videos are available with public access on the ZikaMob project page on YouTube in Portuguese (Zikamob UEPB), whose access link is https://www.youtube.com/channel/UC5i0iBrfMMIXM5J_33ww5pA.

2.3 Description of the Audiovisual Production Assessment Scale (APAS)

The "Audiovisual Production Assessment Scale" (APAS) aims to evaluate videos to verify their potential for behavior change. The scale contains twenty statements, grouped into five sections, sixteen of which are based on the constructs of cognitive theories of behavior change and four refer to subjective analysis. The constructs of the Social Cognitive Theory (observational learning; facilitators) or propositions by Daniel Kahneman in the work "Quick and Slow" (Kahneman, 2012) were considered, as the halo effect and cognitive comfort. A full version of the scale was included as an appendix to this work (Table 1). The APAS sections as well as the evaluated constructs were described below:

- *Observational Learning:* the observation of people performing a certain behavior favors their learning and behavior change. The more someone sees other people performing a certain behavior, the greater the chance of their imitating it (Glanz et al., 2008). To assess this construct, the following statements were used: the video shows the target behavior; the video shows people performing the target action or behavior; the video is understandable and suitable for young people; the behavior shown is correct.
- *Cognitive Comfort:* humorous, short and clear messages promote cognitive comfort that facilitates learning behaviors. Humans are more at ease with the familiar and the easy-to-understand, so when messages are presented that bring these feelings of confidence and familiarity the spectator is more apt to appreciate what they see and believe what they hear (Kahneman, 2012). The statements used to assess this construct were as follows: The message is presented in a good-humored way; audio quality is clear and easily understandable; images are sharp and appropriate to the subject; uses nice graphics and sound effects.
- *Halo and narrative effect:* people who are empathetic and seen as leaders have a positive influence on behavior change over other people (Kahneman, 2012). That is, the message spoken by a prominent person influence those who watch it (halo effect). Furthermore, the use of narrative tends to fix the viewer's attention. To assess these constructs, the following statements were used: the video has a presenter/narrator; the presenter/narrator is friendly and humorous; the video tells a story, that is, it has a narrative that facilitates learning the content; the presenter clearly informs the audience how to complete the prevention action.
- *Facilitation:* the presentation of resources, tools or guidelines on how to perform a behavior can facilitate its learning and imitation (Glanz, Rimer & Viswanath, 2008). To assess the facilitators, the following assertions were used: the video shows the objects needed to carry out the behavior (e.g., screens, software); the video shows the benefits of taking the action; the video encourages the search for more information about the topic; the video shows the need to engage others.
- *Subjective Analysis:* this section does not evaluate a construct, it only takes into account the evaluator's subjective opinion about the quality of the video, and it is verified whether the evaluator liked the video or not, if they consider it important to share it on social media, if it is possible to use it in the classroom and if the instructions given are safe.

When reading the statement, the evaluator expresses his opinion, using a Likert scale, agreeing or disagreeing, partially or completely, with the statement; which allows the item to be scored from 1 to 5. When a certain parameter could not be observed or evaluated, it was not scored (zero). Each video, therefore, could score, in each section, from 0 to 20 points; or, when the first four sessions were combined, the total score ranging from 0 to 80

points was counted to assess the video's potential for behavior change; in this case, the subjective analysis score is not included.

The total score obtained using the APAS allowed the video to be classified into categories that show how much it contributes or not to behavior change. Videos with scores from 0 to 20 points were classified in the category "does not contribute or contribute minimally" to behavior change; from 21 to 39, it partially contributes; from 40 to 59, contributes satisfactorily and over 60 when it showed potential to significantly contribute to behavior change.

Table 1. Audiovisual Production Evaluation Scale (APAS)

OBSERVATIONAL LEARNING	1	The video shows the target behavior.	N.A.	1	2	3	4	5
	2	The video shows people taking action.	N.A.	1	2	3	4	5
	3	The video is understandable and suitable for young people.	N.A.	1	2	3	4	5
	4	The behavior shown is correct.	N.A.	1	2	3	4	5
		Score 1: The video contributes to imitation learning of the target behavior (action or mission).	Total					
COGNITIVE COMFORT	5	The message is presented in a humorous way.	N.A.	1	2	3	4	5
	6	Audio quality is clear and easily understandable.	N.A.	1	2	3	4	5
	7	Images are sharp and appropriate to the subject.	N.A.	1	2	3	4	5
	8	It uses nice graphic and sound effects.	N.A.	1	2	3	4	5
		Score 2: The video promotes cognitive comfort.	Total					
HALO AND NARRATIVE EFFECT	9	It has a presenter/narrator.	N.A.	1	2	3	4	5
	10	The presenter/narrator is friendly and good-humored.	N.A.	1	2	3	4	5
	11	The video tells a story, that is, it has a narrative that facilitates the learning of the content.	N.A.	1	2	3	4	5
	12	The presenter speaks clearly what to do.	N.A.	1	2	3	4	5
		Score 3: The presenter/narrator and the narrative contribute for learning the target behavior.	Total					
FACILITATION	13	The video shows the objects needed to carry out the behavior (eg screens, software).	N.A.	1	2	3	4	5
	14	The video shows the benefits of taking action.	N.A.	1	2	3	4	5
	15	The video encourages the search for more information on the topic.	N.A.	1	2	3	4	5
	16	The video shows the need to engage others.	N.A.	1	2	3	4	5
		Score 4: When watching the video, it's easier to do the action and/or engage people.	Total					
Total		**Total Score: When watching the video, the person feels more motivated to carry out the target behavior object of the educational action.**						
SUBJECTIVE ANALYSIS	17	In my opinion, the video is great.	N.A.	1	2	3	4	5
	18	I would share the video on my social networks.	N.A.	1	2	3	4	5
	19	I would recommend using video in Basic Education.	N.A.	1	2	3	4	5
	20	The action presented in the video is safe, that is, it does not put anyone at risk.	N.A.	1	2	3	4	5
		Score 5 - Subjective analysis score.	Total					

Watch the video; then, mark, in each statement, only one of the options (from 1 to 5 or N.A.), as follows: 1 - I disagree; 2 - I disagree a little; 3 - neither agree nor disagree; 4 - partially agree; 5 - completely agree; and N.A. - not applicable.

2.4 Reliability Analysis and Statistics

For the reliability analysis of the APAS (validation), four evaluators participated (1, 2, 3 and 4) who watched the videos, analyzing them individually. The scale was used in the online form format developed with the Google Forms resource, thus avoiding data typing errors. The set of one hundred videos was divided between two pairs of evaluators (Pair A - evaluators 1 and 3; and Pair B: evaluators 2 and 4). Evaluators 1 and 2 analyzed 48 videos, corresponding to missions 2 (home inspection), 3 (separation of recyclables) and 5 (cleaning effort); and evaluators 3 and 4 analyzed 52 videos referring to mission 4 (window screen). Therefore, each video was

independently evaluated by two researchers and each pair evaluated all the videos assigned to them.

Two pilot studies were carried out to analyze and modify the APAS in order to improve the instrument's internal reliability. Five researchers participated in these studies, who tested the scale by evaluating five videos related to the pilot study of the Zikamob Project, carried out with students from the biology course at UEPB in 2018. The Cronbach's alpha coefficient was measured (Cortina, 1993), and the value was estimated. of 0.80, which showed good reliability of the instrument. APAS, therefore, had several versions prior to the one presented in this work.

Descriptive statistics were used to show the frequency of evaluators' responses to each of the APAS statements. The results of the normality test (Kolmogorov-Smirnov) showed that the scores of each section of the APAS and the total score did not follow a normal distribution; for this reason, non-parametric tests were performed for inferential analysis. Pearson's Chi-Square Test, Mann-Whitney Test (U Test) and Kruskal-Wallis Test for independent samples were used, considering a significance level of 5% (p-value <0.05), to evaluate differences in the frequency of responses between pairs of evaluators, comparing the median values of scores between evaluators and between different educational missions. All analyzes were performed with the aid of SPSS statistical software. In addition, Cronbach's Alpha was calculated to measure the instrument's internal reliability and Kappa statistics to assess interobserver agreement.

3. Results

3.1 APAS Reliability

Table 2 shows the frequency of responses for each of the statements of the APAS scale, comparing the results between pairs of raters A and B. It was found that, of the twenty statements, 15 of them had no significant difference between raters in the Test analysis Pearson's Chi-square test, which indicates good reliability of the instrument. However, five statements showed different frequencies for the set of videos evaluated among the evaluators, showing subjectivity in relation to their understanding. The items that need to be better defined are the following: adequacy of the video for young people; the quality of audio and message; sound effects and if the video highlights the need to engage other people in actions to prevent arboviruses.

The section referring to the subjective analysis showed no significant difference in the researchers' assessment. In their opinion, 12% of the videos were considered excellent, having potential use in Basic Education; in terms of safety, practically all videos (98%) showed prevention actions without risk to the population.

Figure 1A shows the median and quartile values for the scores of each section of the APAS and Figure 1B the values of the total scores; comparatively between the pairs of evaluators A (1/3) and B (2/4). There was no significant difference in the Mann-Whitney test for the different scores when comparing raters 1 and 2; 3 and 4 and the pairs, showing good reliability of the scale used (Table 3). The Cronbach's alpha value obtained from the analysis of 16 items (16 statements, excluding those from the subjective analysis), showed excellent internal reliability of the instrument, with a value of 0.941. The results regarding the agreement analysis using the Kappa statistics ranged from 0.290 to 0.450 for the different items (statements) analyzed. The lower values are due to the fact that the Likert scale was used instead of a binary scale to assess the opinion of the evaluators.

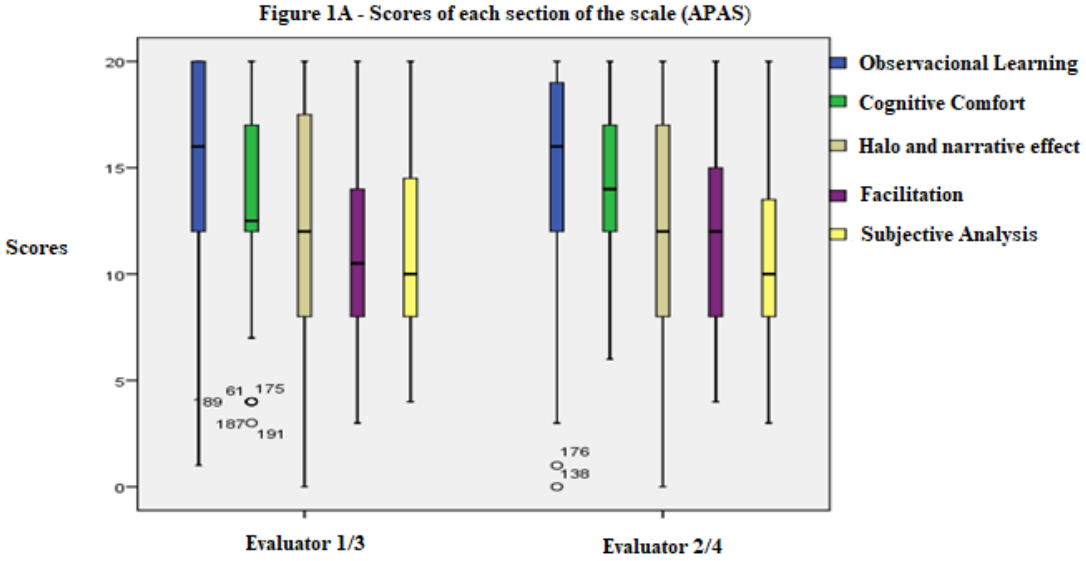
2.2 Indicators Based on Behavior Change Theories

Table 4 shows the number and frequency of videos classified in each of the APAS classification categories, which indicates the contribution of the video content to behavior change in relation to arboviruses. On average, 22 (33.8%) of the videos produced received scores greater than 60 points, indicating that they have the potential to significantly contribute to population behavior change in relation to the prevention of mosquito-borne arboviruses; 28 (41.3%) contribute satisfactorily; 15 (22.9%), partially and from one to two videos were scored with values lower than 19 points, which indicates that they should not be used in educational interventions (Table 4). The Mann-Whiney Test (U Test) was performed to compare the frequencies observed for each of the categories between the evaluators ($p<0.05$), with no significant differences being observed. That is, the proportion of videos classified in each of the evaluation categories was not different between the evaluators individually or grouped in pairs (Table 4).

Of all the 100 videos analyzed, the average frequency of those who received the highest score on the Likert scale was calculated from the assessment of the pairs, considering the data shown in Table 2. Altogether, 40% of the productions showed the target behavior of the educational activity (mission); 54% had people performing the target behavior; 41% were considered understandable and suitable for the young audience; 42% showed the correct preventive behavior; 23% presented a humorous message; 33% had excellent audio quality; 32% exhibited clear and adequate images to the proposed theme; 22% used pleasing graphics and sound effects; 51% had a presenter/narrator; 26% exhibited a sympathetic and humorous presenter/narrator; 26% presented a narrative; 27% the presenter/narrator presented the action; 38% showed the objects needed to perform the behavior; 17% highlighted the benefits of taking the action; 11% encouraged the search for more information on the topic; 13% showed the need to engage other people (Figure 2).

Table 2. Number and frequency of responses for each item of the Audiovisual Production Assessment Scale (APAS) compared to the two pairs of evaluators. Pearson's Chi-Square Test was performed to assess differences in the frequency of responses between pairs ($p<0.05$). Abbreviations: 1 – completely disagree; 2 – I partially disagree; 3 – do not agree or disagree; 4 – partially agree and 5 – completely agree

Audiovisual Production Assessment Scale (APAS)	**Number and proportion (%) of videos scored on each of the Likert scale concepts**																				**Pearson Test**
	Pair A (1/3)										**Pair B (2/4)**										
Statements	**1**		**2**		**3**		**4**		**5**		**1**		**2**		**3**		**4**		**5**		p-value
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
1 - The video shows the target behavior.	10	10.8	5	5.4	21	22.6	22	23.7	35	37.6	11	11.8	4	4.3	12	12.9	27	29.0	39	41.9	0.503
2 - The video shows people performing the action.	12	13.2	0	0.0	17	18.7	13	14.3	49	53.8	14	15.2	4	4.3	9	9.8	16	17.4	49	53.3	0.14
3 - The video is understandable and suitable for young people.	2	2.0	0	0.0	33	33.0	15	15.0	50	50.0	1	1.0	3	3.0	37	37.4	27	27.3	31	31.3	0.022*
4 - The behavior shown is correct.	14	14.9	2	2.1	22	23.4	24	25.5	32	34.0	11	11.6	3	3.2	19	20.0	15	15.8	47	49.5	0.223
5 - The message is presented in a humorous way.	12	12.1	4	4.0	43	43.4	18	18.2	22	22.2	1	1.0	7	7.0	48	48.0	21	21.0	23	23.0	0.031*
6 - The audio quality is clear and easily understandable.	4	4.2	2	2.1	40	41.7	11	11.5	39	40.6	3	3.0	9	9.0	33	33.0	30	30.0	25	25.0	0.002*
7 - Images are sharp and appropriate to the subject.	4	4.0	5	5.0	38	38.0	21	21.0	32	32.0	7	7.0	5	5.0	35	35.0	22	22.0	31	31.0	0.913
8 - Uses nice graphics and sound effects.	29	29.9	3	3.1	28	28.9	12	12.4	25	25.8	7	7.0	13	13.0	44	44.0	17	17.0	19	19.0	<0.001*
9 - It has a presenter/narrator.	3	3.6	0	0.0	30	35.7	12	14.3	39	46.4	2	2.5	0	0.0	26	32.5	8	10.0	44	55.0	0.685
10 - The presenter/narrator is friendly and good-humored.	5	6.0	1	1.2	39	47.0	17	20.5	21	25.3	2	2.5	1	1.3	37	46.3	19	23.8	21	26.3	0.845
11 - The video tells a story, that is, it has a narrative that facilitates the learning of the content.	21	21.2	12	12.1	24	24.2	15	15.2	27	27.3	17	18.5	8	8.7	25	27.2	19	20.7	23	25.0	0.777
12 - The presenter speaks clearly about what to do.	19	21.6	8	9.1	20	22.7	13	14.8	28	31.8	20	24.1	6	7.2	22	26.5	16	19.3	19	22.9	0.681
13 - The video shows the objects needed to carry out the behavior (e.g. screens. software).	9	9.1	8	8.1	30	30.3	14	14.1	38	38.4	12	12.0	5	5.0	25	25.0	21	21.0	37	37.0	0.561
14 - The video shows the benefits of taking action.	30	30.0	8	8.0	32	32.0	12	12.0	18	18.0	25	25.3	12	12.1	31	31.3	15	15.2	16	16.2	0.788
15 - The video encourages the search for more information about the topic.	41	41.0	11	11.0	31	31.0	4	4.0	13	13.0	26	26.0	14	14.0	42	42.0	10	10.0	8	8.0	0.058
16 - The video shows the need to engage other people.	52	52.0	3	3.0	24	24.0	7	7.0	14	14.0	29	29.0	8	8.0	39	39.0	12	12.0	12	12.0	0.008*
17 - In my opinion, the video is great.	39	39.0	7	7.0	27	27.0	12	12.0	15	15.0	38	38.0	8	8.0	31	31.0	12	12.0	11	11.0	0.914
18 - I would share the video on my social networks.	62	62.0	6	6.0	12	12.0	5	5.0	15	15.0	58	58.0	12	12.0	13	13.0	6	6.0	11	11.0	0.578
19 - I would recommend the use of video in Basic Education.	58	58.0	8	8.0	12	12.0	6	6.0	16	16.0	59	59.0	16	16.0	7	7.0	9	9.0	9	9.0	0.162
20 - The action presented in the video is safe, that is, it does not put anyone at risk.	1	1.0	0	0.0	0	0.0	0	0.0	99	99.0	0	0.0	0	0.0	0	0.0	2	2.0	96	98.0	0.22



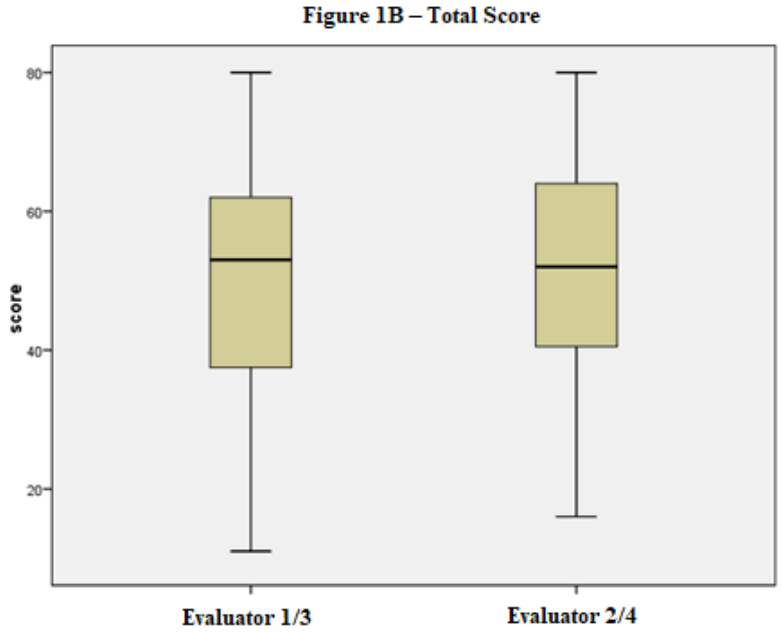


Figure 1. Boxplot Diagram with median and quartile values referring to the scores of each of the sections of the Audiovisual Production Assessment Scale (APAS) and the total score, comparatively between the pairs of evaluators (A and B)

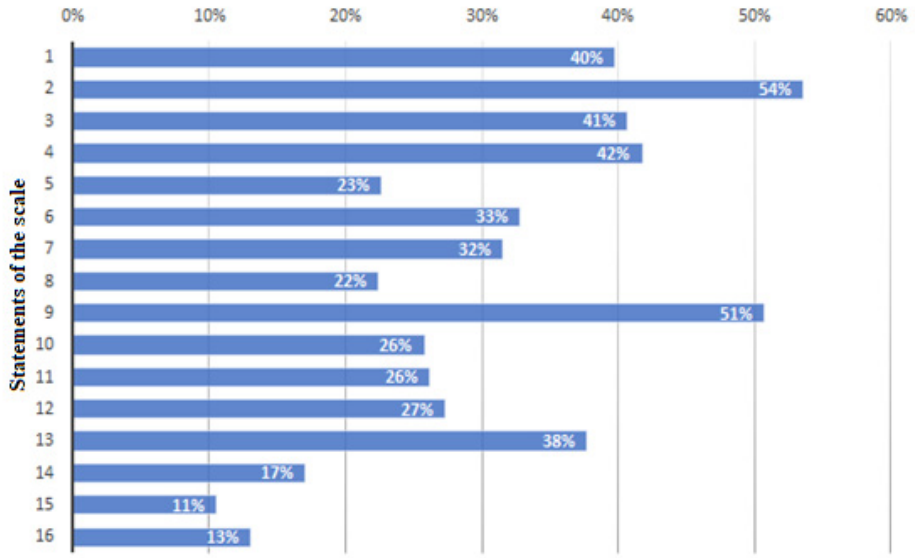


Figure 2. Average frequency of videos that received the highest score on the Likert scale for each of the statements of the Audiovisual Production Assessment Scale (APAS). The statements from 1 to 16 were described in Table 1

Table 3. Median values for the scores of each section and the total score of the Audiovisual Production Assessment Scale (APAS), comparatively between the evaluators individually and grouped in pairs, with the results of the Mann-Whitney Test (U Test) ($p < 0.05$)

Scores for each section of the APAS	Missions 2, 3 e 5		Teste U	Mission 4		Tese U	Pairs		Test U
	Evaluators			Evaluators			Evaluators		
	1	2	p	3	4	p	A (1/3)	B (2/4)	p
Score 1: The video contributes to learning by imitating the target behavior (action or mission).	18	18	0.539	13	15	0.636	16	16	0.907
Score 2: The video promotes cognitive comfort.	15	14	0.771	12	12	0.769	13	14	0.472
Score 3: The presenter/narrator and the narrative contribute to the learning of the target behavior.	15	15	0.289	12	12	0.735	12	12	0.659
Score 4: When watching the video, it's easier to take action and/or engage people.	10	14	0.159	12	12	0.979	11	12	0.228
Total Score: When watching the video, the person feels more motivated to perform the target behavior object of the educational action	56	59	0.844	48	47	0.738	53	52	0.667
Subjective Score: The evaluator's opinion on the quality of the video.	12	12	0.451	10	10	0.964	10	10	0.695

The quality of audiovisual productions varied according to the mission carried out by high school students. Figures 3A and 3B show the median and quartile values of the section scores and the APAS total score for each of the educational missions. The videos produced in missions 2 (home inspection) and 3 (separation of recyclables) had a total score of 57 and 58 points, respectively; while missions 4 (screen the windows) and 5 (cleaning) scored 48 and 41 points, respectively. In fact, the results of the Kruskal-Wallis Test for independent samples showed that there was a significant difference in the median values between the missions for the scores referring to the constructs “observational learning” ($p<0.001$) and “cognitive comfort” ($p=0.031$); as well as for the total score ($p=0.023$) and subjective analysis ($p = 0.006$). This shows that the scale is sensitive to assess the diversity of production quality (Table 5).

Altogether, 12 videos out of a total of 100 (12%) received maximum points in relation to the score related to the promotion of behavior change and also for the subjective analysis. Therefore, the use of APAS can facilitate the assessment of audiovisual production in educational interventions using gamification and social media, as was done during the ZikaMob project.

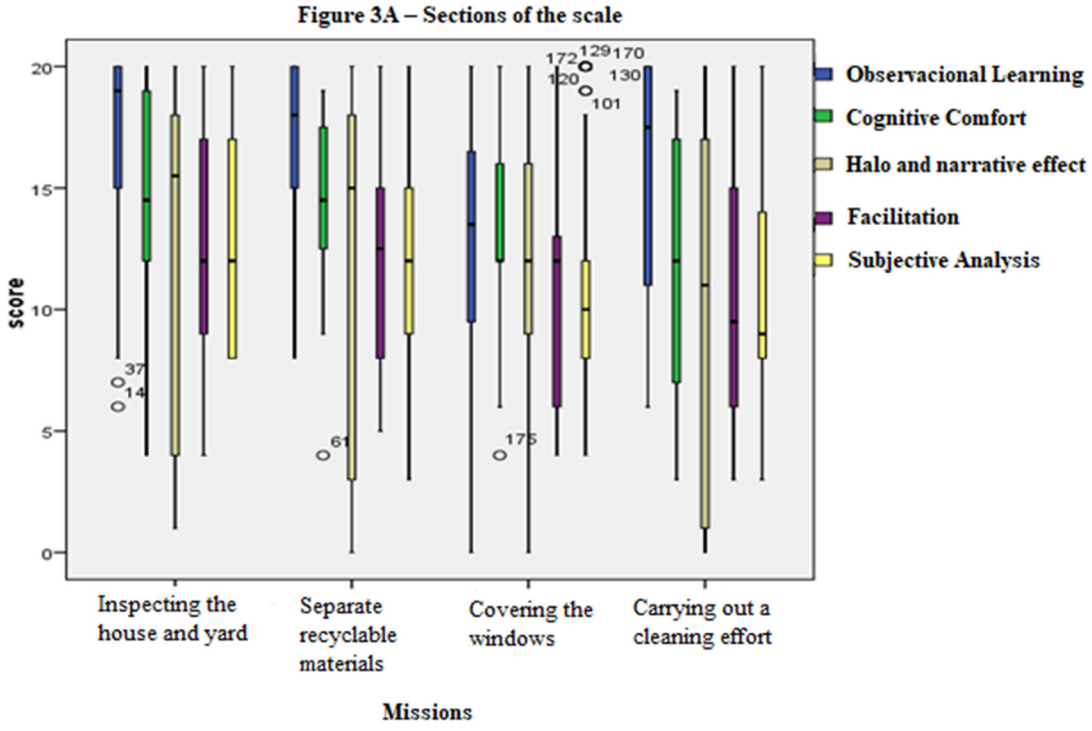
Table 4. Number and frequency of videos classified in each of the classification categories of the Audiovisual Production Assessment Scale (APAS), which indicates the contribution of production to behavior change in relation to arboviruses. The Mann-Whiney Test (U Test) was performed to compare the observed frequencies of each category between the evaluators ($p<0.05$)

		APAS classification categories that indicate the contribution of audiovisual production to behavior change								
		Does not contribute		**Contributes partially**		**Contributes satisfactorily**		**Contributes completely**		**Test U**
		(0-19 points)		(20-39 points)		(40-59 points)		(<60 points)		
		n	%	n	%	n	%	n	%	p-value
Individual assessment	Evaluator 1	1	2.1	10	20.8	18	37.5	19	39.6	0.561
	Evaluator 2	1	2.1	10	20.8	14	29.2	23	47.9	
	Evaluator 3	1	1.9	16	30.8	21	40.4	14	26.9	0.68
	Evaluator 4	1	1.9	10	19.2	30	57.7	11	21.2	
Peer assessment	Evaluator 1/3	2	2.0	26	26.0	39	39.0	33	33.0	0.547
	Evaluator 2/4	2	2.0	20	20.0	44	44.0	34	34.0	
Number and Average Frequency		**1**	**2.00**	**15**	**22.90**	**28**	**41.3**	**22**	**33.8**	**-**

Note. evaluators 1 and 2 analyzed the videos referring to actions 2, 3 and 5; while evaluators 3 and 4 analyzed the videos from mission 4.

Table 5. Median values for the scores of each section and the total score of the Audiovisual Production Assessment Scale, compared between arbovirus prevention missions; with results of the Kruskal-Wallis Test for independent samples ($p<0.05$)

	Arbovirus prevention missions				**Kruskal-Wallis Test**
	Inspect the home	**Separate recyclables**	**Screen windows**	**Cleaning effort**	
	Median	**Median**	**Median**	**Median**	**p-value**
Score 1: The video contributes to learning by imitating the target behavior (action or mission).	19	18	14	18	>0.001
Score 2: The video promotes cognitive comfort.	15	15	12	12	0.031
Score 3: The presenter/narrator and the narrative contribute to the learning of the target behavior.	16	15	12	11	0.592
Score 4: When watching the video, it's easier to take action and/or engage people.	12	13	12	10	0.062
Total Score: When watching the video, the person feels more motivated to perform the target behavior object of the educational action	57	58	48	41	0.023
Subjective Score: The evaluator's opinion on the quality of the video.	12	12	10	9	0.006



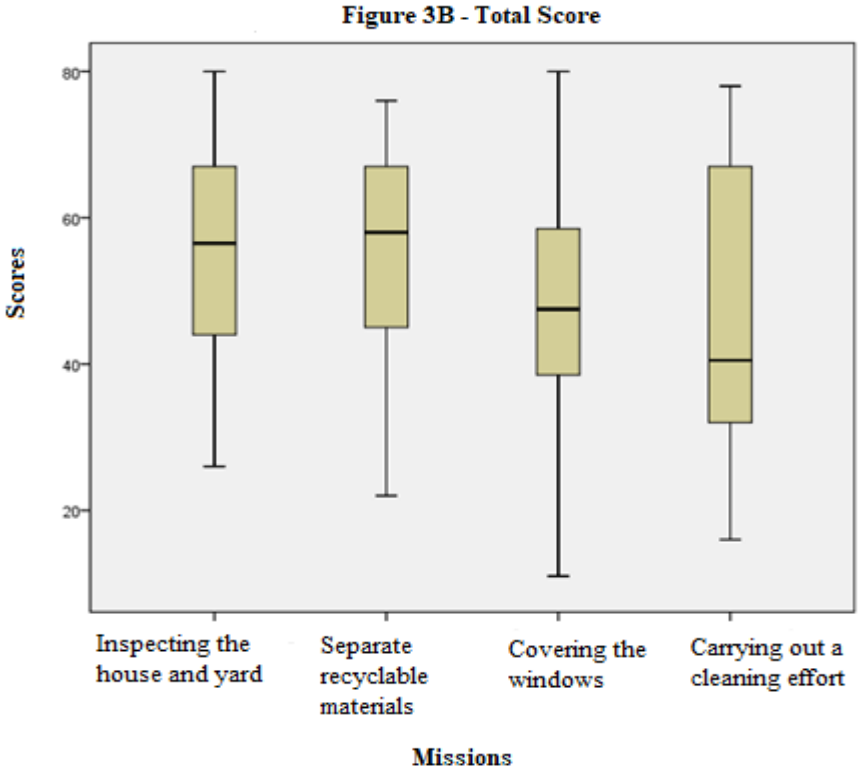


Figure 3: Boxplot Diagram with median and quartile values referring to the scores of each of the sections of the Audiovisual Production Assessment Scale (APAS) (Figure 3A) and the total score, comparatively between different missions of the educational intervention (Figure 3B). The theme of each mission was used to produce videos published on social media

4. Discussion

One of the challenges when producing videos or audiovisual content for social media, such as Facebook, in order to disseminate health promotion and prevention actions, is to assess the quality of this content and how much it contributes to encouraging the population to change their behavior. Regarding applications, there are internationally validated scales, such as the "Mobile App Rating Scale", which has been increasingly used to assess the quality of applications used for Health Education (Stoyanov et. al., 2015). However, regarding the assessment of videos or audiovisual products, there are few examples of existing assessment scales and forms. This work, therefore, is innovative in the sense of developing a tool that can be used to evaluate any production that has foundations in the constructs of behavior change theories.

In the area of Education, for example, the use of videos as a learning tool has been around for several decades. However, in a review carried out by Snelson (2018), based on an analysis of 61 published works, it was shown that there are few assessment scales for these teaching resources. Generally, authors create different tools to assess audiovisual production without an initiative to unify and standardize these tools, in order to enhance comparative studies. It is already a consensus that audiovisual production facilitates learning and develops creativity and technological skills considered important in contemporary society. However, there are no validated instruments based on specific theories that allow for more comprehensive generalizations regarding their impact on the learning of conceptual and procedural content, or on behavior change.

In the context of Public Health, some studies indicate that the use of videos in interventions can also be promising for Health Education actions (Tuong, Larsen, & Armstrong, 2014). In the review study developed by Abed et al. (2014), the effectiveness of the videos was linked to some criteria identified as crucial for the success of health education: the format in which information is presented and the complexity of the intervention's target behavior. In this study, three video presentation formats demonstrated importance and greater efficiency: didactic – objective information verbally and graphically; practice – real people involved in a specific action; and narrative – staging or narrative of information. Videos with spoken or graphical information were not considered adequate to stimulate behavior change.

The three formats pointed out in the study by Abed et al. (2014) are in accordance with the SCT observational learning principles and those proposed by Kahneman (2012), which are related to cognitive comfort, the halo effect and the use of narrative. Such principles were used in the elaboration of the scale developed and evaluated in this work. Therefore, the videos that obtained the highest scores in the "Total Score" presented the characteristics considered essential to promote behavior change according to Abed et al. (2014).

In educational intervention proposals, such as ZikaMob, in which a competition was used to produce content on preventive behaviors broadcast on social media, one of the biggest challenges was the definition of criteria for evaluating the quality of productions that could also induce changes in behavior with impacts for health promotion. When participating in a competition, participants want to know what parameters are used to define the winning videos. Thus, they are more attentive to the criteria for assessing audiovisual production. The proposition of an evaluation scale that has already been validated, as was done in this work, and that has good reliability, can facilitate the process of content production by the participant and evaluation by researchers; in addition to also serving to choose productions with more quality and that can be used as educational material on social media. The dissemination of quality content is essential for promotion and prevention in the health area; avoiding the dissemination of wrong messages from a scientific point of view.

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In this work, we found that 12 of the videos produced by high school students, during an educational intervention, received maximum marks using the APAS, and about 33 were considered suitable for promoting behavior change. Therefore, it appears that most of the videos produced did not have certain characteristics that can facilitate the learning of behaviors, not being adequate to comply with the proposal to induce a change in health practices, such

as the prevention of arboviruses. With further use of the APAS to support another round of instruction and video production, the authors contend that this percentage number would increase significantly.

The use of APAS in educational interventions has some advantages, such as the possibility of inducing the production of videos with characteristics that favor behavior change, such as the use of narrative and humorous messages. It can also be used to evaluate any educational intervention, regardless of the theme, because it is not specific for preventing arboviruses. However, the APAS assesses some constructs of the behavior change theories specific to the Social Cognitive Theory and the theories proposed by Daniel Kahneman. It is, therefore, limited with regard to the evaluated constructs. For its further use, some items and statements which had lower results in the validation process must be revised to increase the agreement between observers.

One of the limitations of this work was the division of all the videos to be analyzed in pairs of observers. To improve the accuracy and agreement of the use of the scale, we intend, in future work to develop a didactic material for training of evaluators with some video examples. The analysis of a larger number of videos with more observers can also contribute to defining more precisely the scale parameters, reducing the subjectivity of the analysis.

5. Conclusion

The Audiovisual Production Assessment Scale is an assessment tool for audiovisual content that can be used in educational interventions in health, with good internal reliability of the instrument being verified, subject to minor revisions. The scale allows evaluating any content, classifying the production into categories that reveal its potential to promote behavior change in the population. The authors hope that other researchers will take the APAS and use it to both support their research findings and, importantly, as an iterative instructional tool for producers of videos – especially young ones – to better understand how to increase the impact of their productions and make progressively better content. This in turn has the potential to have public health benefits.

5.1 Ethics Approval and Consent to Participate

The school-based intervention protocols and evaluation of APAS were approved by the Research Ethics Committee of Paraiba State University (UEPB), under protocol CAAE 67429517.5.0000.5187, and it was in accordance with the principles of Resolution 466/12 of the Brazilian National Health Council. Informed consent was obtained from all subjects and from the legal guardians/parents of the students. Methods were carried out in accordance with relevant guidelines and regulations.

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Competing Interests Statement

The authors declare that they have no competing interests.

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