Psychological scales adaptation for conservation: Example of human-wildlife conflict for Komodo dragon conservation.

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Abstract.

Human-wildlife conflict (HWC) is one of common conservation problems where habitat fragmentation tends to increase the number of encounters between wild animals and humans. A number of studies have considered psychological measurements to assess social factors affected by or related to HWS. However, a limitation of most studies lies in the absence of a validation procedure to ensure that survey methods are not culturally biased. In this study, we used a cross-cultural adaptation of psychological scales to conduct HWC assessment in the context of human-Komodo dragon (*Varanus komodoensis*) conflicts in North Flores, Indonesia. The adaptation process involved vetting, modification and translation of four scales based on the Theory of Planned Behavior, Comfortable Interpersonal Distances, Attitudes toward Animals and Emotional Pictorial Scales. From this study, it is indicated that the adaptation process we used was successful thanks to a consistent correlation among the first three measurements. We therefore advocate our approach for a more accurate measuring of human attitudes and perception towards wild animals.

Keywords: Conservation psychology, attitudes, scale adaptation, human - wildlife coexistence, retaliatory killing.

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Introduction

Human-wildlife conflict, a conservation problem that arises as a consequence of resource competition between humans and wildlife, has often been studied for a mitigation program which included assessments of human attitudinal factors (Dickman, 2010). The inclusion of human dimension measurements in the context of HWC assessments, such as intention and social norm scales as proposed by the Theory of Planned Behavior (TPB) (e.g. Marchini & Macdonald, 2012; St. John, et al., 2017) and Attitudes Toward Animals (e.g. Mitchell, Bruyere, Otieno, Bhalla, & Teel, 2018), has brought about a better understanding of human perspective in HWC contexts. However, measurement adaptation processes have rarely been considered during data collection in cultures that are clearly different from those of Western countries where original theories developed in a relatively more self-centered and open to free expression culture. Applying standard protocols could therefore produce culturally biased results in Eastern countries that are more community-centered and considerate of the social situation whenever people exchange opinions such as China and Indonesia (Forsyth, O'boyle, & McDaniel, 2008).

A measurement adaptation process is conducted by cross-cultural adaptation, which is defined as the process of adapting a measure originally developed in a specific language (in most cases English) to countries with a different cultural and linguistic background (Guillemin, Bombardier, & Beaton, 1993). As humans differ across communities, differences and similarities in values, beliefs, habits, norms and other psychological dimensions are most likely to be found. People from two different communities may have different perceptions of the same factor or event.

An adaptation process is necessary in order to make a measurement valid and relevant for a specific culture (Beaton, Bombardier, Guillemin, & Ferraz, 2000). The fact that 77% of psychology studies published in American Psychological Association journals were conducted on

European or North American respondents, which represent just 5% of the world population (Arnett, 2008), has made it questionable whether most theories and findings could be extrapolated to other societies (Henrich, Heine, & Norenzayan, 2010). Particularly, in a HWC context, results based on biased measurements may not accurately describe the real situation, and might therefore lead to an incorrect mitigation strategy.

This study aimed at undertaking an adaptation process to make specific psychological measurements usable in a wildlife conservation context by studying known conflicts occurring between Komodo dragons and communities within and outside protected areas in Northern Flores, Indonesia.

Methods

Types of Psychological Measures

We referred to the cross-cultural adaptation process of Beaton, Bombardier, Guillemin, & Ferraz (2000). We then tested for the reliability of each measurement by using an internal consistency reliability method (Cozby & Bates, 2012). This procedure was important to ensure that questionnaires were relevant and applicable to a specific community (Moon, 2017).

We tested one self-report measure and five sets of scales. The self-report measure is derived from the TPB, which is used to measure some aspects that are related to real behavior: attitudes, subjective norms, perceived behavioral control and intentions (Ajzen, 1991). This theory focuses mostly on the cognitive element that may affect an individual's behavior within a specific social context. Subjective norm considers something that is shaped by the culture or social community where an individual lives or by social pressure (Ajzen, 1991). The TPB has been used in several wildlife-related human dimension studies and it is arguably one of the best approaches to

understand human behavior and intentions in HWC (Miller, 2017), and also pro-environmental behavior (Yuriev, Dahmen, Paillé, Boiral, & Guillaumie, 2020).

The first scale that we tested was the Comfortable Interpersonal Distance (CID) developed by Duke and Nowicki (1972). This scale was originally developed to measure how a respondent's personal space is influenced by proximity to another person. That is useful to assess the comfortable distance one person keeps from others. This measurement was also developed in the context of interpersonal relationship. In HWC, conservationists want to establish a better coexistence between humans and wild animals, and for Komodo dragons we argue that measuring a perceived optimum distance that is safe and comfortable for the local community is a way to measure local people's readiness to coexist.

The Attitudes toward Animals (ATA) scale from Driscoll (1995) was the second scale we used. The ATA has been previously applied in other HWC studies on large carnivores in Norway (Vittersø, Kaltenborn, & Bjerke, 1998) and charismatic fauna in West Africa (Grúnová, Brandlová, Svitálek, & Hejčmanová, 2017). Those studies used the ATA scale of Kellert (1984), which is appropriate to categorize respondents' attitude depending on their evaluation of animals from a specific list. In the initial scale development, respondents were categorized by ten tendencies of value-based attitudes (e.g. "Naturalistic", "Ecologistic") depending on their evaluation of a group of animals ranging from cockroaches to elephants (Kellert, 1984). As we wanted to measure locals' perception towards a specific animal, we decided to use an adaptation of the method of Driscoll (1995) using six dimensions: 'useful-useless', 'smart-stupid', 'responsive-unresponsive', 'lovable-unlovable', 'safe-dangerous', and 'important-unimportant'. Driscoll (1995) study was focused on domestic animals or pets, so we decided not to use the 'responsive-unresponsive' measure because interaction between Komodo dragons and humans is not a frequent event.

The third scale we used was the Emotional Pictorial Scale based on Komodo dragon pictures. This scale was set in order to explore the possibility of using a pictorial scale to measure emotions of local people when they see a Komodo dragon in multiple specific situations, for example when it kills a wild deer and/or livestock, or when it is in close proximity to people premises or tourists. We used this measurement from a classic study conducted by Ekman and Friesen (1971) who found six basic emotions from people of New Guinea matching those of Western culture: happiness, anger, fear, sadness, surprise and disgust. We use these six basic emotions along with emoticon for each emotion to explore emotions of respondents in a situation involving Komodo dragons. The emoticons we developed were based on a computational project called the Grimace Project, which assessed the human facial muscles contractions involved in each emotion and then transformed them into emoticons (Spindler & Fadrus, 2009). Coexistence requires familiarity with the behavior of wild animals. Assessing which Komodo dragon behavior evokes negative emotions in local people may allow targeted interventions that could change local people's perception of *V. komodoensis*.

Two other scales we used were the Connectedness to Nature Scale (CNS) of Mayer and Frantz (2004) and Identity Fusion of Swann, Gomez, Seyle, Morales, and Huici (2009). The CNS is a measure to identify to which extent one feels emotionally connected to the natural world (Mayer and Frantz, 2004). We tested CNS because it has been shown to have a significant correlation with behavior in nature (Nisbet, Zelenski, & Murphy, 2009) and towards wildlife conservation (Gosling & Williams, 2010). On the other hand, Identity Fusion scale measures a cognitive representation of self-identities where the border between the self and the group is blurred (Swann, Gomez, Seyle, Morales, & Huici, 2009). We modified and tested this scale to assess the tendency of locals to see Komodo dragons as part of their self.

Study Area

The study was conducted in two areas on the Island of Flores, Southeast Indonesia, part of the Komodo dragon distribution outside Komodo National Park (Figure 1). The first study site was Longos Island off the northwestern coast of Flores, where the presence of Komodo dragons was first recorded in 2005 (Komodo Survival Program, 2016). This is a 478 ha islet with four hamlets of approximately 1,000 inhabitants, mostly fishermen. The habitat is predominantly dry deciduous Monsoon forest and Mangrove forest. Longos is not part of the Flores Nature Reserve networks and has not yet been the target of any conservation initiative. The second study site included the municipalities of Pota and Riung, located further east along the northern coast of Flores. Here, current threats to Komodo dragons are poaching of key prey species, namely the Timor deer (*Rusa timorensis*), and habitat degradation, which has significantly reduced the abundance and distribution of Komodo dragons in Flores (Ciofi and De Boer 2004, Ariefiandy et al. 2015).

[FIG. 1: Komodo dragon distribution and research sites map]

We prepared all scales that required verbal understanding including the TPB, CID and Attitudes Toward Animals scales translated and adapted through the process shown in Figure 2.

Figure 2. Cross-cultural adaptation process diagram in our study based on work from Beaton, Bombardier, Guillemin, and Ferraz (2000)

Pilot Study

We set up a pilot study to test the results of cross-cultural scale adaptation. We first assessed how easy it was for respondents to understand the questions and statements in the questionnaire. We then conducted a quantitative analysis to measure the reliability of and correlation between each scale.

The study was conducted in May 2016 in Longos Island using 60 respondents. Before each interview and questionnaire session, we gave respondents an informed consent form. We then asked questions about livestock depredation by wild animals. We asked respondents to fill out a

questionnaire that consisted with CNS, CID, and Identity Fusion. Respondents were shown eight pictures of Komodo dragons consisting of two pictures of Komodo dragons walking, three different pictures of hunting activities, two pictures of Komodo dragons with tourists, and one picture of two Komodo dragons fighting. Each time a picture was presented, the respondent would react with one emoticon only. Two sets of pictures were shown to respondents, each set differing in the order with which pictures were presented (counterbalancing). Respondents were then asked to provide written answers to 11 complete sets of TPB questions, ATA and verbal answers to two open-answer questions relating to Komodo dragons. Finally, we asked for personal details.

During the Longos pilot study, while CNS was found to be a reliable scale (Chronbach $\alpha = 0.752$), most people hardly understood it because the context of the statements was not suitable for locals. For example, respondents considered the statement “*When I think of my life, I imagine myself to be part of a larger cyclical process of living (translated in Bahasa Indonesia as: Saat saya berpikir tentang kehidupan, saya membayangkan bahwa saya adalah bagian dari lingkaran hidup yang lebih besar.)*” not pertinent and difficult to understand. We also decided to omit the Identity Fusion scale because it did not correlate with other scales that we used.

For TPB, we decided to use only the Intention scale despite the excellent reliability of other scales and the high correlation among them. The reason was that using all scales under TPB was exhausting for respondents, and it could lead to fatigue and a drop in enthusiasm in answering other questions, important for our measurements. We wanted to make our measurement scales as efficient as possible while making our respondents comfortable. For the ATA and Emotion Pictorial Scale, the respondents found the questions linked to each measurement relatively easy to understand so we decided to use it in the study to be conducted further east on North Flores

(Pota and Riung). Also of importance was the development of an open-answer session prior to take first measurements in order to build trust and make a good relationship with respondents.

Final Study

The main study was carried out in 2016 in 9 villages in the municipalities of Pota and Riung, northern Flores. Measurements were conducted on 270 respondents. Prior to conducting the quantitative component of the interview we asked respondents informal questions about unrelated general subjects (e.g. citizenship, social dynamics and general knowledge on wild animals around their neighborhood). After about 15 minute interviews, we asked respondents about the number of conflicts with Komodo dragons as well as livestock management practices, including reasons for keeping livestock. We then asked respondents to consider an imaginary line with a circle at the beginning of the line. The circle would represent the respondent which was then asked to draw an imaginary distance at which he/she would feel comfortable to stay from a Komodo dragon (CID). The CID we developed was less complicated than the one in the pilot study, which was created to measure interpersonal distances (to other humans) as shown in Figure 3. The new CID was easier to understand by the respondent and focused on one animal only. The answer was measured by the distance between the first dot (“You”) and the distance given by the respondent in centimeters.

(a)

Please point on a distance that you feel comfortable to be near a Komodo dragon:

You

(b)

Figure 3. The CID scale in pilot study (a), and final measure (b)

Shortly after, we asked respondents to rate the extent to which they felt Komodo dragons to be useful/useless, smart/stupid, lovable/unlovable, safe/dangerous, and important/unimportant animals. In addition, we asked respondents how beneficial/disadvantageous they perceived Komodo dragons to be. An example of this scale is shown in Figure 4. The measurement consisted

of 6 dots of the Likert scale, from a negative to a positive attitude. In the analysis, each dot was converted into 1 (left spectrum) to 6 (right spectrum). Respondents were assisted while filling the measurement chart.

Figure 4. ATA item sample

We then asked respondents to rate a series of pictures depicting Komodo dragons engaged in different activities such as hunting, defense, fighting and their behavior in presence of tourists. Respondents had to rate their emotions towards a Komodo dragon using a pictorial scale with emoticons representing happiness, anger, fear, sadness, surprise and disgust. For each picture, respondents could only answer with one type of emoticon, for they were instructed to “choose the first emotion that you felt when you first saw this picture”. Each emoticon represented an unique emotion and maintained a non-numerical scale rather than converting the emotion into a number (Figure 5).

Figure 5. Sample picture of Komodo dragon fight in Emotion Pictorial Scale

Finally, before asking personal details, we assessed the intention of respondents to coexist with Komodo dragon by asking to rate two statements on a 6 point scales from do not intend at all to very intend: “I intend to coexist with a Komodo dragon that I see in my neighborhood” and “If a Komodo dragon appears in my premises I will try to coexist with it”. We then asked their age, gender, religion, tribe, education, how many years they have been living there and settlement status (permanent or non permanent resident), monthly income, and whether they knew that Komodo dragons are a protected species. At the end of the session, we thanked the respondent and gave a sticker as a sign of appreciation.

Prior to each session, we handed the respondent an informed consent form. Because not all respondents were literate, we read all the scales and forms, and helped respondents in filling the measurement charts. All procedures and questionnaires were approved by the ethic committee of the Faculty of Psychology, Universitas Indonesia. We used SPSS Statistics 22 for data analysis. Pearson correlation was used for inter-item and inter-scale correlation, and Pearson Chi-Square to identify relationships between continuous scale (TPB, ATA, and CID) with Emotion Pictorial Scale.

Results

Demography

We conducted our study on 270 respondents, of which 80% men ($N = 216$) and 20% women ($N = 54$), of an average age of 47.42 years . The imbalanced gender participation was due to local culture in which men represent their family, so if there is a stranger conducting the interview, it will be the man of the family who will answer the questions. Men are also more involved in social and community activities and this was another factor leading to a male-biased ratio of respondents.

Most respondents believed in Islam (68.1%), followed by Roman Catholics (31.9%). The majority of respondents (39.6%) had an elementary school education, while 20.4% and 22.2% had a junior high and high school education, respectively. Most of them were residents (99.3%) and worked as either farmers (58.1%) or fishermen (9.3%). Average income was 1,165,000 Indonesian Rupiahs per month (equals to approximately US\$ 80 per month).

Inter-Item Correlation

This analysis was used to test the consistency among items for the multiple-item scales, ATA and two items for intention. The results for ATA showed a consistent and significant positive correlation between items, as shown in Table 1.

Table 1. Inter-item correlation for Attitudes toward Animals scale

	Useful	Smart	Lovable	Safe	Important
Useful	-	$r = 0.17^{**}$	$r = 0.39^{**}$	$r = 0.20^{**}$	$r = 0.55^{**}$
Smart	-	-	$r = 0.23^{**}$	$r = 0.13^{*}$	$r = 0.21^{**}$
Lovable	-	-	-	$r = 0.26^{**}$	$r = 0.49^{**}$
Safe	-	-	-	-	$r = 0.29^{**}$

Note = ** significant at $p = \leq 0.01$, * significant at $p \leq 0.05$

We also found that the ATA items all correlated with perceived beneficial attitude statements, as shown in Table 2. For two intention statements, all statements positively correlated to each other ($r = 0.84$, $p = 0.00$), showing that both items consistently measured the respondents' intention to coexist with Komodo dragons.

Table 2. Inter-item correlation for Attitudes toward Animals scale and “Beneficial” statement

	Useful	Smart	Lovable	Safe	Important
Beneficial	$r = 0.58^{**}$	$r = 0.19^{**}$	$r = 0.46^*$	$r = 0.30^{**}$	$r = 0.64^{**}$

Note = ** significant at $p \leq 0.01$

Inter-Scale Correlation

We run the inter-scale correlation for scales to ensure that they produced results that were consistent with one another. The first correlation was ATA and Intention to see if positive attitudes of respondents toward Komodo dragons could explain the level of intention to coexist with Komodo dragons. Before running the analysis, we calculated the mean for both intention statements.

Table 3. Inter-scale correlation for Attitudes toward Animals items, “Beneficial” statement, and Intentions

	Useful	Smart	Lovable	Safe	Important	Beneficial
Intention	$r = 0.27^{**}$	$r = 0.15^{**}$	$r = 0.15^*$	$r = 0.23^{**}$	$r = 0.28^{**}$	$r = 0.30^{**}$

Note = ** significant at $p = \leq 0.01$, * significant at $p \leq 0.05$

As shown in Table 3, intention statements were positively correlated with each attitude towards Komodo dragons, showing that the measures consistently demonstrated attitude and intention of respondents to coexist with Komodo dragons. According to the CID and ATA analyses, all attitude

items were negatively correlated with CID (Table 4), showing that the more positive attitude towards Komodo dragons, the less perceived distance respondents were willing to keep in the context of coexistence with Komodo dragons.

Table 4. Inter-scale correlation for CID and Attitudes toward Animals

	Useful	Smart	Lovable	Safe	Important	Beneficial
CID	$r = -0.22^{**}$	$r = -0.15^*$	$r = -0.20^*$	$r = -0.26^{**}$	$r = -0.24^{**}$	$r = -0.27^{**}$

Note = ** significant at $p = \leq 0.01$, * significant at $p \leq 0.05$

We found that CID was also negatively correlated with intention statements ($r = -0.34$, $p = 0.00$). This result showed that when respondents had an intention to coexist with Komodo dragons, they were willing to be in a perceived closer distance to the animals.

As far as the Emotional Pictorial Scale concerns, this is a non-numerical scale with emotion as an answer, so we run a crosstabs with Pearson Chi-Square to find if there was any consistent emotion answers towards Komodo dragon pictures among the different scale responses. Detailed information on the emotional response is provided in Table 5, and correlation with the other three scales is shown in Table 6.

Table 5. Frequency of respondents' emotional response for each Komodo picture

	Anger	Sadness	Fear	Disgust	Surprise	Happy
Komodo hatchling	5	62	4	21	150	14
Adult Komodo	10	95	6	12	127	9

Komodo eat boar	27	88	17	14	95	16
Komodo eat deer	55	80	10	10	79	26
Komodo fight	8	65	6	11	160	7
Female Komodo guarding nest	1	23	56	3	10	151
Komodo with foreign tourists	9	26	1	8	209	5
Komodo with domestic tourists	6	47	1	11	188	5

Table 6. The association between other measures to Emotion Pictorial Scale

	Komodo Hatchling	Adult Komodo	Eating boar	Eating deer	Komodo Fight	Guarding Nest	Foreign tourist	Domestic tourist
Useful	$X^2 = 23.39$ $df = 25$ $p = 0.55$	$X^2 = 24.29$ $df = 25$ $p = 0.50$	$X^2 = 34.33$ $df = 25$ $p = 0.10$	$X^2 = 31.90$ $df = 25$ $p = 0.16$	$X^2 = 19.83$ $df = 25$ $p = 0.75$	$X^2 = 23.42$ $df = 30$ $p = 0.79$	$X^2 = 27.71$ $df = 25$ $p = 0.32$	$X^2 = 21.21$ $df = 25$ $p = 0.68$
Smart	$X^2 = 41.90$ $df = 25$ $p = 0.01^*$	$X^2 = 18.22$ $df = 25$ $p = 0.83$	$X^2 = 14.05$ $df = 25$ $p = 0.96$	$X^2 = 29.53$ $df = 25$ $p = 0.24$	$X^2 = 35.56$ $df = 25$ $p = 0.07$	$X^2 = 30.80$ $df = 30$ $p = 0.42$	$X^2 = 38.12$ $df = 25$ $p = 0.04^*$	$X^2 = 43.95$ $df = 25$ $p = 0.01^*$
Lovable	$X^2 = 42.56$ $df = 25$ $p = 0.01^*$	$X^2 = 43.93$ $df = 25$ $p = 0.01^*$	$X^2 = 20.65$ $df = 25$ $p = 0.71$	$X^2 = 35.19$ $df = 25$ $p = 0.08$	$X^2 = 17.72$ $df = 25$ $p = 0.85$	$X^2 = 46.85$ $df = 30$ $p = 0.26$	$X^2 = 41.28$ $df = 25$ $p = 0.02^*$	$X^2 = 22.29$ $df = 25$ $p = 0.61$

Safe	$X^2 = 21.13$ $df = 25$ $p = 0.68$	$X^2 = 41.33$ $df = 25$ $p = 0.02^*$	$X^2 = 19.14$ $df = 25$ $p = 0.79$	$X^2 = 20.34$ $df = 25$ $p = 0.72$	$X^2 = 22.99$ $df = 25$ $p = 0.57$	$X^2 = 34.08$ $df = 30$ $p = 0.27$	$X^2 = 33.35$ $df = 25$ $p = 0.12$	$X^2 = 25.48$ $df = 25$ $p = 0.43$
Important	$X^2 = 37.40$ $df = 25$ $p = 0.05^*$	$X^2 = 29.43$ $df = 25$ $p = 0.24$	$X^2 = 20.74$ $df = 25$ $p = 0.70$	$X^2 = 33.06$ $df = 25$ $p = 0.12$	$X^2 = 27.68$ $df = 25$ $p = 0.32$	$X^2 = 49.74$ $df = 30$ $p = 0.01^*$	$X^2 = 37.01$ $df = 25$ $p = 0.05^*$	$X^2 = 46.07$ $df = 25$ $p = 0.00^{**}$
Beneficial	$X^2 = 51.40$ $df = 25$ $p = 0.00^*$	$X^2 = 33.47$ $df = 25$ $p = 0.12$	$X^2 = 18.60$ $df = 25$ $p = 0.81$	$X^2 = 27.46$ $df = 25$ $p = 0.33$	$X^2 = 29.77$ $df = 25$ $p = 0.23$	$X^2 = 41.12$ $df = 30$ $p = 0.08$	$X^2 = 63.97$ $df = 25$ $p = 0.00^{**}$	$X^2 = 41.39$ $df = 25$ $p = 0.02^*$
CID	$X^2 = 377.70$ $df = 370$ $p = 0.38^*$	$X^2 = 420.27$ $df = 375$ $p = 0.05^*$	$X^2 = 342.97$ $df = 375$ $p = 0.88$	$X^2 = 357.37$ $df = 370$ $p = 0.67$	$X^2 = 428.74$ $df = 375$ $p = 0.02^*$	$X^2 = 565.58$ $df = 450$ $p = 0.00^*$	$X^2 = 525.56$ $df = 375$ $p = 0.00^{**}$	$X^2 = 290.24$ $df = 375$ $p = 1.00$
Intention	$X^2 = 40.91$ $df = 40$ $p = 0.43^*$	$X^2 = 69.34$ $df = 40$ $p = 0.00^*$	$X^2 = 49.72$ $df = 40$ $p = 0.13$	$X^2 = 36.48$ $df = 40$ $p = 0.62$	$X^2 = 43.19$ $df = 40$ $p = 0.33$	$X^2 = 69.88$ $df = 48$ $p = 0.02^*$	$X^2 = 41.94$ $df = 40$ $p = 0.38$	$X^2 = 30.30$ $df = 40$ $p = 0.86$

*Note = ** significant at $p = \leq 0.01$, * significant at $p \leq 0.05$*

Some pictures induced specific emotions and related to some items from ATA, CID and intention. For instance this was particularly the case for the pictures of Komodo dragons with foreign and local tourists as far as the attitude of perceived importance and benefit concerned. However, the correlation pattern was not consistent with other scales, i.e. CID and Intention. The

Emotional Pictorial Scale may therefore not be appropriate to measure attitude and intention to coexist with a wild animal.

Discussion

In this study we reported consistent correlations among three attitudes and intention measurements in the context of human-wildlife conflict: Attitudes toward animals, perceived comfortable distance, and intention statements derived from the theory of planned behavior. The consistent correlations among three measures also showed how a respondent positive attitude towards Komodo dragons related with people intent to coexist with the animal and even their willingness to get closer (at a safe distance) to it. However, there was no such consistent correlation when the Emotional Pictorial Scale was considered. Some pictures were correlated with perceived benefit or importance of a wild animal, but not with the intention to coexist and CID. This means that measuring emotion with pictures of a Komodo dragon does not provide an insight into the respondent attitude, nor the intention to coexist. Other measurements are strongly encouraged to be tested in the future for measuring emotion.

The three measurements can be used to assess HWC, whether it is for a one-time measurement to formulate a conflict mitigation strategy, or as a tool for longitudinal assessment to provide insights on how successful a mitigation program is. This includes multiyear comparison (e.g. Mitchell, Bruyere, Otieno, Bhalla, & Teel, 2019) and perception and real conflict figures comparison (e.g. Behmanesh, Malekian, Hemami, & Fakheran, 2019). Though our last scale was not consistently correlated with other scales, the fact that the “surprise” emotion has mostly appeared after respondents were shown the pictures, this scale can be used by conservationists for a descriptive assessment. The “surprise” emotion means that respondents didn’t know how a

Komodo dragon could behave in the situation depicted in the pictures, such as fighting or being close to tourists without attacking them. This descriptive assessment can help researchers to understand to what extent the targeted community knows the behavior and biology of the animal.

We were unable to compare this methodology testing to other studies, mainly because of the limited number of works available on social or psychological measurements adaptation or development. This study also presented some limitations that would need to be considered for future research. First, there is a possibility that CID induces fear on respondents because people are asked to provide a distance between them and a wild predator. This fear might be very subtle and unconscious, and may affect the answers to the other scales. In addition, this method needs a distance scale (e.g. 2 or 3 meters, and indicated directly by the respondents after they answer the imaginary distance), so the perception of the distance will be more accurate when translated to real situation. Second, we set a 15 minute opening session to build a rapport with respondents, and this may affect their interest over the whole session of interviews and questionnaires. We therefore suggest to test out a control group with no rapport building in future research. We hope that by resolving these issues, we will be able to provide more highly qualified social measurements and help conservationists to get a better understanding of human dimensions in wild animal conservation management strategies.

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