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Willingness of the German population to donate toward bird conservation: An application of the protection motivation theory

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ABSTRACT

In this study, the *protection motivation theory* (PMT) was used to investigate factors influencing self-reported willingness to donate and actual donations to conserve endangered bird species. The PMT was extended to include sociodemographic factors (gender, age, education, and income), as well as knowledge about and attitudes toward birds. Data were collected in Germany through an online questionnaire ($N = 579$, $M_{Age} = 49.15$, $SD = 16.93$, *women* = 51.6 %). Regression analyses showed that the cognitive assessment processes of the PMT, (1) threat appraisal of endangered bird species, and (2) coping appraisal of threat toward endangered bird species were significant predictors of an individual's willingness to donate. An individual's attitudes toward birds strengthened willingness to donate, but not actual donations. Knowledge about birds had no influence on willingness to donate or actual donation behavior. Women were more likely to donate and higher perceived barriers were associated with lower rates of actual donations. A discrepancy between willingness to donate and actual donations is evident, which indicates an *intention-behavior gap*. The results suggest that conservation and education campaigns should be used to increase the population's awareness of existing threats toward endangered bird species, including the constructs of PMT, which could positively influence both willingness to donate and actual donations. Similarly, engagement initiatives could target individuals' *self-efficacy* to engage in bird conservation and possible coping measures should be made transparent and tangible by stakeholders looking to foster bird conservation.

1. Introduction

Human behavior is degrading ecosystems and poses an existential threat to biodiversity worldwide. As a result, researchers agree that biodiversity conservation requires behavioral change (Nielsen et al., 2021; Saunders et al., 2006; Schultz, 2011). Particularly in the context of conservation, psychological factors determine whether humans engage in appropriate actions (Samways, 2018). Accordingly, psychology can play a central role in solving environmental problems and fostering biodiversity conservation (Saunders et al., 2006; Schultz, 2011; Steg and Vlek, 2009).

Biodiversity conservation is an important practice in which communities worldwide engage to preserve threatened species (Inger et al., 2015; IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), 2019). Birds are valuable indicators of biodiversity because they are well-studied and their population trends correlate with those of other taxa (Gregory et al.,

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2008). Additionally, birds are widely distributed, and sensitive to anthropogenic influences (Gregory et al., 2008; Gregory and Strien, 2010). Furthermore, birds provide irreplaceable benefits to humans and other species through pollination, pest control, seed dispersal, and the connection of ecological processes between different habitats (Daily et al., 2000; Prokop et al., 2008; Sekercioglu, 2006; Whelan et al., 2008; Zander et al., 2014).

Nevertheless, many bird species are endangered and declining. Worldwide, a total of 13.3 % of bird species are threatened with extinction (IUCN (International Union for Conservation of Nature), 2020). Anthropogenic influences lead to these decreases through loss and degradation of habitats, intensive agriculture, logging, pollutants, wind turbines, and power lines (BfN (Bundesamt für Naturschutz [Federal Agency for Nature Conservation]), 2019; Grüneberg et al., 2015).

Non-governmental organizations (NGOs) play a key role in bird conservation, and most of these NGOs rely on public donations (Veríssimo et al., 2018). In general, funding for biodiversity conservation is scarce (Lundberg et al., 2019; Waldron et al., 2013). With a large part of the funding going to charismatic species, particularly mammals, funding for birds is regularly lower than necessary to adequately conserve all species (Bennett et al., 2015; Czech et al., 1998; Fančovičová et al., 2021; Kontoleon and Swanson, 2003; McCarthy et al., 2012). Accordingly, donations from the general public are needed to enhance conservation measures toward birds. Using a representative population survey in Germany, this study investigated the influence of psychological factors on donation behavior toward bird conservation.

In environmental psychology, various theories are used to describe and explain pro-environmental behavior (Steg and Nordlund, 2019). In the present study, we focus on the *protection motivation theory* (PMT) as a theoretical framework to explain the willingness to donate (WTD; sometimes expressed as willingness to pay) and actual donations toward bird conservation (Fig. 1). The PMT predicts behavior as a function of *threat appraisal* and *coping appraisal* (Rogers, 1975; Rogers and Prentice-Dunn, 1997). Few studies have examined the intention-behavior relationship in the context of the PMT, yet the PMT has successfully explained pro-environmental motivation and behavior in several studies (Kothe et al., 2019). Examples include environmental and climate-protective intentions (Bockarjova and Steg, 2014; Kim et al., 2012; Rainear and Christensen, 2017; Shafiei and Maleksaeidi, 2020), conservation intentions toward supporting the return of wolves (Hermann and Menzel, 2013), and WTD toward the conservation of insects (Dörge et al., 2022). Accordingly, the present study assumes that WTD and actual donations toward bird conservation can be predicted by the PMT.

In addition to the PMT constructs, various other factors have been proposed to influence the WTD toward endangered birds (Brouwer et al., 2008; Kotchen and Reiling, 2000; Ojea and Loureiro, 2007; Zander et al., 2014). For example, sociodemographic factors such as gender, age, educational background, and income appear to play a role (Brouwer et al., 2008; Kotchen and Reiling, 2000; Ojea and Loureiro, 2007). Likewise, knowledge regarding the endangerment status of species is often suggested to influence conservation motivation (Lundberg et al., 2019; Turpie, 2003; Wilson and Tisdell, 2005). An individual's attitude toward birds can also positively influence WTD (Kotchen and Reiling, 2000; Zander et al., 2014).

As a result, we extended the PMT by including the aforementioned factors (Fig. 1). In the following section, beginning with the two dependent variables—WTD and actual donations toward bird conservation—the tested factors are described in detail.

To our knowledge, the present study will be the first to measure both WTD and actual donations toward bird conservation. It is often assumed that an intention to act (WTD) does not always translate to behavior, thus theoretical studies focusing on human

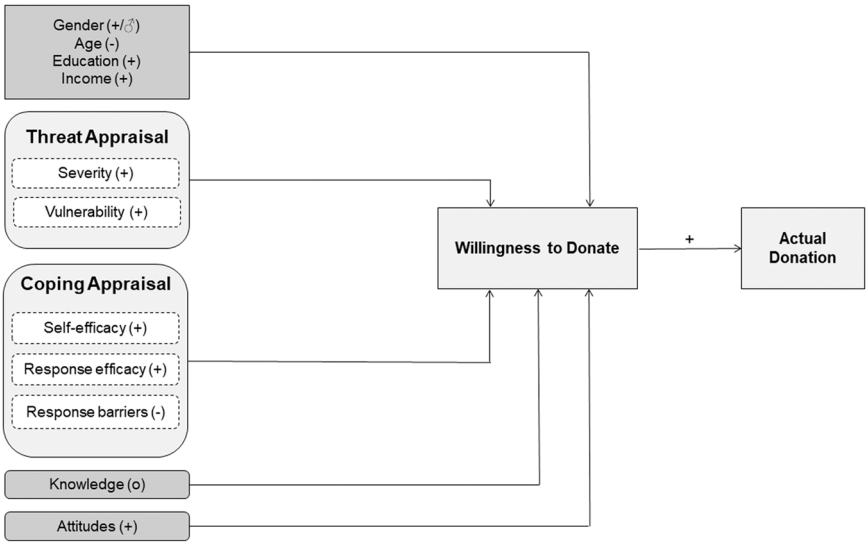

Fig. 1. Extended model of the protection motivation theory (PMT) to predict willingness to donate and actual donations toward bird conservation in Germany. *Note:* Variables of the PMT are colored in light gray. Extensions of the PMT are marked in dark gray (gender, age, education, income, knowledge, and attitudes). Latent variables are represented in round boxes and manifest variables in square boxes. For the sake of clarity, the influences on the actual donations are not shown. We assume that the predictors have the same influence on them as on the willingness to donate. Only for attitudes, no influence on actual donations is expected. + = positive influence, − = negative influence, o = no influence.

intentions do not necessarily need to be helpful in conservation biology. We submit that measuring actual donations in our study may provide more precise evidence of the intention-behavior gap within the specific context of bird conservation (Ajzen et al., 2004; Kollmuss and Agyeman, 2002; Sheeran and Webb, 2016).

In summary, the present study aims to investigate how (1) sociodemographic factors, (2) PMT constructs, and (3) knowledge about and (4) attitudes toward birds influence WTD and actual donations to endangered bird conservation in Germany.

2. Theoretical background and current state of research

2.1. Willingness to donate and actual donations

Several studies have examined the WTD toward biodiversity conservation measures (Cárdenas and Lew, 2016; Veríssimo et al., 2009; Wang and Jia, 2012; Zander et al., 2014). Zander et al. (2014) found that in Australia, 45.0 % of respondents would be willing to donate toward bird conservation. In a similar study, participants from England reported being willing to donate to increase the diversity of bird species in urban greenspaces (Dallimer et al., 2013). Participants in the Netherlands were willing to donate an average of 8.80 € toward the conservation of migratory birds (Brouwer et al., 2008). In another study, participants from Spain were willing to donate an average of 21.31 € toward conservation projects for the *Common Guillemot* (Ojea and Loureiro, 2007). However, all of these studies investigated only WTD, not actual donations. In contrast, Leliveld and Risselada (2017) investigated actual donation behavior. Their research suggests that most participants did not donate their reward for participating in an online questionnaire study to different charities. Indeed, studies that investigated both intentions and behavior are scarce. As one example, Dörge et al. (2022) demonstrated a positive influence of WTD on donations toward insect conservation, but also found evidence for the often cited *intention-behavior gap*. Nevertheless, insects can be regarded as much less charismatic compared to birds (Czech et al., 1998; Martín-López et al., 2007), hence there may be an even larger gap between intentions and behavior for insect species. In the present study, both the WTD and actual donations are measured. Specifically, a positive influence of WTD on actual donations is expected.

2.2. Sociodemographic variables and donation behavior

Many studies have addressed the influence of sociodemographic variables on biodiversity conservation behavior and WTD (Adamu et al., 2015; Lundberg et al., 2019; Wang and Jia, 2012). Research suggests that sociodemographic variables only predict a small proportion of pro-environmental behavior (Stern, 2000). Nevertheless, we investigated the influence of gender, age, education, and income. Regarding *gender*, men seem to be more willing to donate toward conservation-related issues (Adamu et al., 2015; Kamri, 2013; Wang and Jia, 2012). For birds, men reported a higher WTD toward the conservation of endangered bird species (Zander et al., 2014) and migratory birds (Brouwer et al., 2008). Generally, men appear to prefer birds of prey, whereas women tend to prefer smaller birds, which could translate to donation behavior (Bjerke and Østdahl, 2004).

Several studies have found evidence for *age* as a predictor of donation behavior in biodiversity conservation. Whereas some studies have suggested that older people demonstrate a higher WTD toward nature conservation (Adamu et al., 2015; Wang and Jia, 2012), other studies have observed the opposite (Dallimer et al., 2013; Martín-López et al., 2007). Most research concerning bird conservation, however, argues that older people have a lower WTD (Ojea and Loureiro, 2007; Zander et al., 2014; for evidence to the contrary, see Kaval and Roskruge, 2009).

In terms of *education levels*, higher education is not only often associated with being more likely to be a member of a charitable organization, but also with greater support for environmental and animal welfare (Srnka et al., 2003). Moreover, higher education levels are often associated with a higher WTD toward the conservation of biodiversity and protected areas (Adamu et al., 2015; Kamri, 2013; Wang and Jia, 2012) as well as toward ecosystem conservation (Lundberg et al., 2019). Specifically, Brouwer et al. (2008) demonstrated a positive influence of education level on WTD toward migratory bird conservation.

The positive influence of *income* on WTD toward conservation has been shown in several studies (Adamu et al., 2015; Brouwer et al., 2008; Kaval and Roskruge, 2009; Kotchen and Reiling, 2000; Ojea and Loureiro, 2007). In general, higher income is often associated with engaging in biodiversity conservation efforts (Baldock et al., 2019). Srnka et al. (2003) also found that participants with a higher income donated more toward animal and environmental conservation. Additionally, a higher income strengthened the acceptance of higher taxes going toward regional bird conservation (Kaval and Roskruge, 2009) and increased WTD toward conservation of certain birds, such as the *Peregrine Falcon* (Kotchen and Reiling, 2000) and the *Common Guillemot* (Ojea and Loureiro, 2007).

In line with these findings, we expect that men will be more likely to donate than women, younger people more than older people, higher educated people more than less educated people, and people with higher income more than people with lower income.

2.3. Protection motivation theory and donation behavior

In general, the PMT assumes two cognitive processes: (1) *threat appraisal* and (2) *coping appraisal*. *Threat appraisal* can, in turn, be divided into subcomponents: (a) the perception of the *severity* of the threat to endangered bird species and (b) the probability of occurrence (*vulnerability*) of this threat. The process of *coping appraisal* can also be divided into subcomponents: (a) the perceived ability to engage in bird conservation behavior (*self-efficacy*), (b) the perceived effectiveness of the response (*response efficacy*), and (c) the situational barriers, constraints, and anticipated behavioral effort to conserve endangered bird species (*response barriers*). When applied to bird conservation, if both *severity* of the threat toward birds and *vulnerability* are perceived to be high, and if conserving birds appears feasible by successfully coping with this threat via *self-efficacy* and *response efficacy*, the development of WTD and,

consequently, actual donations are likely. Accordingly, a low threat perception, high situational barriers, or a high anticipated behavioral effort would be disadvantageous for the development of WTD toward the conservation of endangered bird species (Dörge et al., 2022; Hermann, 2012; Rogers, 1983).

Based on the theoretical assumptions of the PMT, we assume that high levels of *severity*, *vulnerability*, *self-efficacy*, and *response efficacy*, in conjunction with few perceived *response barriers*, will lead to a higher WTD and more actual donations toward bird conservation.

2.4. Attitudes and donation behavior

Attitudes can be defined as an affective, cognitive, or behavioral evaluation of an object, in our case birds, ranging from negative to positive (Breckler, 1984; Gifford and Sussmann, 2012). Attitudes are thought to have an indirect influence on behavior via behavioral intentions (Ajzen et al., 2004; Pronello and Gaborieau, 2018). Affection, sympathy, and a vested interest can all lead to positive attitudes toward animals (Serpell, 2004). Furthermore, pro-environmental attitudes appear to positively influence WTD (Aldrich et al., 2007; Choi and Fielding, 2013; Dörge et al., 2022; Kotchen and Reiling, 2000; Martín-López et al., 2007). Studies on bird conservation suggest that positive attitudes toward endangered birds in Australia (Zander et al., 2014) and positive attitudes toward the *Peregrine Falcon* (Kotchen and Reiling, 2000) positively influenced WTD.

In line with research on the theory of planned behavior (Ajzen et al., 2004), we assume that positive attitudes toward birds will have a direct influence on WTD, and only an indirect positive influence via behavioral intention (WTD) on actual donations.

2.5. Knowledge and donation behavior

Previous studies regularly assumed that environmental knowledge predicts pro-environmental behavior (Frick et al., 2004; Hines et al., 1987; Kollmuss and Agyeman, 2002). Indeed, knowledge has been found to be a predictor of conservation action and WTD toward biodiversity and birds (Lundberg et al., 2019; Turpie, 2003). Lundberg et al. (2019), for example, showed that increased knowledge regarding biodiversity is associated with an increased willingness to donate, especially toward birds. Similarly, Wilson and Tisdell (2005) found that knowledge on the threat status of endangered Australian bird species positively influenced intentions to engage in conservation behavior. In contrast, some studies that examined knowledge of environmental facts (Onel and Mukherjee, 2016) and prior knowledge of the particular species (Kotchen and Reiling, 2000) suggested that factual environmental knowledge has no direct influence on WTD.

As we only surveyed factual knowledge about birds, and not knowledge concerning their threat status, we assumed that knowledge in our study would not influence WTD or actual donations. Nevertheless, we included it in our tested model, as knowledge is often cited as a core factor in the context of biodiversity conservation and may be positively related to attitudes toward birds (Prokop et al., 2008).

3. Materials and methods

3.1. Procedure and sampling

Data collection was carried out online using a panel from the *Consumerfieldwork GmbH* (Consumerfieldwork GmbH, 2018). Quotas for age, gender, and federal state were applied to ensure a sample approaching representativeness of the German population. Data collection took place in December 2019. The minimum age of participants was 18. Respondents received 2 € for participating in the study.

The final sample consisted of 579 participants (see Table 1 for descriptive statistics). Four respondents were excluded due to incomplete information. The sample consisted of 51.6 % women and 48.4 % men, which approximates the gender distribution of the German population (women = 50.7 %; men = 49.3 %; Destatis (Statistisches Bundesamt [Federal Statistical Office]), 2019). The average age of the German population is 44.4 years (Destatis (Statistisches Bundesamt [Federal Statistical Office]), 2019), and the average age of our sample was 49.2 years (SD = 16.9). The slightly higher average age can be explained by the age restriction for this study. Compared to the German population, the sample had a higher educational level. The average monthly net household income of the sample ranged from 2250 € to 2750 €, which is lower than the average monthly income of a primary income earner in the German population in 2018 (3661€; BPB (Bundeszentrale für politische Bildung [Federal Agency for Civic Education]), 2020).

3.2. Questionnaire and variables

The questionnaire was embedded in a research project on attitudes, knowledge, and conservation behavior toward birds in Germany. The six constructs that were analyzed in the present study comprised a total of 69 items: (1) general attitudes toward birds (24 items), (2) PMT variables with *threat appraisal* (*severity*: six items; *vulnerability*: three items), and *coping appraisal* (*self-efficacy*: three items; *response efficacy*: three items; *response barriers*: four items), (3) knowledge about birds (20 items), (4) WTD toward bird conservation (one item), (5) actual donations toward bird conservation (one item), and (6) sociodemographic information (four items:

Table 1
Frequency statistic of the sociodemographic variables ($N = 579$).

Variable	Response format	Frequency in %
Gender	"men" (1)	48.4
	"women" (2)	51.6
Age	18–20 years	2.2
	21–24 years	5.4
	25–39 years	25.5
	40–59 years	36.6
	60–64 years	7.4
	> 65 years	22.9
Education level	"no degree" (1)	0.2
	"secondary education" (2)	11.7
	"intermediate school-leaving certificate" (3)	35.1
	"advanced technical college entrance qualification" (4)	11.4
	"general qualification for university entrance" (5)	41.6
Income[a]	"no information" (1)	8.8
	"below 850 €" (2)	3.8
	"851 to below 1250 €" (3)	10.4
	"1250 to below 1500 €" (4)	6.2
	"1500 to below 2000 €" (5)	12.5
	"2000 to below 2500 €" (6)	13.5
	"2500 to below 3500 €" (7)	22.8
	"3500 to below 5000 €" (8)	16.9
	"5000 € and above" (9)	5.1

The sociodemographic data were collected according to the specifications of the federal statistical (Destatis (Statistisches Bundesamt [Federal Statistical Office]), 2016).

[a] 51 respondents chose the option "no information". These were considered missing values.

gender, age, education, income). Furthermore, the questionnaire included the following attention check within the "attitudes toward birds" scale: "*Please click 'Strongly disagree' on the far left to demonstrate that you are paying attention to our study.*" People who answered this question differently ($N = 18$) were automatically excluded from further participation.

3.3. Willingness to donate and actual donations

In the present questionnaire, both WTD and actual donations toward endangered bird conservation were assessed. WTD toward bird conservation was inquired with the item *"I would donate money for projects that actively support the conservation of endangered bird species in Germany*", following the scale by Büssing et al. (2018), investigating the return of wolves. Participants could indicate their WTD on a six-point Likert scale from "1 = *strongly disagree*" to "6 = *strongly agree*".

To measure their actual donations, participants were given the option to donate their 2 € rewards for completing the questionnaire. Before being able to donate, participants were informed that their donation would go to the Nature and Biodiversity Conservation Union (NABU), a well-known NGO in Germany. For more credibility, their official logo was placed beneath the item.

Participants were asked: "*What percentage of your reward for completing the questionnaire would you like to donate to the conservation of endangered bird species in Germany?*" The answer was collected on a slider ranging from 0 % to 100 % in 1 % steps. The WTD and the actual donations were assessed separately in the questionnaire. Once subjects were on the actual donation page, they could not change their WTD. At no previous point did the respondents know that they would be asked about their WTD or their actual donation.

3.4. Sociodemographic variables

Sociodemographic factors in the present study include gender, age, and monthly net household income (income), and education level (Table 1). Gender was recorded dichotomously (*men* = 1; *women* = 2). Age was recorded as a whole number. The standardized categories of the federal statistical office (Destatis (Statistisches Bundesamt [Federal Statistical Office]), 2016) were used to record educational qualifications. Income was also collected based on standardized categories from the federal statistical office (Table 1). Non-answers were treated as a "missing value".

3.5. Threat and coping appraisal

The items of the PMT were based on those used by Hermann and Menzel (2013), who successfully applied the PMT to explain conservation behavior toward the return of wolves in Germany. These items were adapted to the conservation of birds by changing the

term "animal" to "endangered bird species" in the wording of the items. Answers were given on a six-point Likert scale from "1 = *strongly disagree*" to "6 = *strongly agree*". For the *vulnerability* items, a scale from "1 = *very unlikely*" to "6 = *very likely*" was used. Inverse items were recoded.

Threat appraisal included the subcomponents *severity* (five items) and *vulnerability* (three items). *Severity* comprised the perceived threat by the participants both to humans (*altruistic concern*) and to nature or ecosystems (*biospheric concern*; Schultz, 2000). Example items are: "*If endangered bird species in Germany are not preserved, this is a loss for all people who can no longer get to know the bird species*" (*altruistic concern*) and "*If endangered bird species in Germany are not preserved, the ecological balance will be seriously disturbed*" (*biospheric concern*). Perceived vulnerability was measured with inversely coded items such as "*Endangered bird species will spread again in Germany.*" *Coping appraisal* was operationalized with the variables *self-efficacy* (three items), *response efficacy* (three items), and *response barriers* (four items). Example items are: "*I can contribute to the conservation of endangered bird species in Germany myself*" (*self-efficacy*), "*There are effective options that guarantee the conservation of endangered bird species*" (*response efficacy*), and "*Since I have to expect restrictions, I cannot accept the conservation of endangered bird species*" (*response barriers*).

The items of the PMT constructs were tested for factor loading using principal component analysis. In line with our theory, two factors could be extracted for the *threat appraisal* items, with *severity* explaining 47.3 % and *vulnerability* 25.9 % of the total variance of 73.27 %. The constructs had good internal consistency, with Cronbach's α-values of 0.92 for *severity* and 0.86 for *vulnerability* (Field, 2018). In the principal component analysis of *coping appraisal*, the three theoretical factors could be extracted. The items of *self-efficacy* and *response efficacy* loaded clearly on the corresponding factors. One item from the *response barriers* subcomponent ("*Since the economic interests are too great, my efforts to conserve endangered bird species are pointless*") cross-loaded on *self-efficacy*. Nevertheless, due to a higher factor loading and no improved reliability without this item, the item was retained in the *response barriers* subcomponent. Overall, *self-efficacy* (23.2 %), *response efficacy* (22.3 %), and *response barriers* (21.9 %) explained 67.94 % of the total explained variance. Cronbach's α-values of 0.81 (*self-efficacy*), 0.79 (*response efficacy*), and 0.72 (*response barriers*) indicated sufficient internal consistency.

3.6. Attitudes

Kellert's (1979) typology of attitudes toward wildlife is most commonly used to capture attitudes toward animals (Kellert and Berry, 1987; Prokop et al., 2008; Prokop and Tunnicliffe, 2010). The survey on attitudes toward birds was based on Kellert's (1979) typology of attitudes toward wildlife. For the present study, 24 items were selected from similar studies and adapted toward bird conservation (Kellert and Berry, 1987; Martens et al., 2019; Prokop et al., 2010; Prokop and Tunnicliffe, 2010). Of the 24 items, 6 were assigned to each of the following attitude dimensions: *ecoscientistic*, *negativistic*, *naturalistic,* and *moralistic* (based on 9 dimensions from Kellert, 1979). Based on a principal component analysis, the items were assigned to the attitude dimensions. The attitude dimension *ecoscientistic* included statements about the interest in the biology of birds and the function of birds in their environment (e.g., "*I would like to know how scientists study birds.*"). The *negativistic* attitude dimension measured active rejection, fear, and avoidance of birds (e.g., "*Birds scare me more than other animals.*"; all items were reverse coded). The attitude dimension *naturalistic* is linked to interest in and affection for nature and wildlife (e.g., "*I would like to have many birds in my garden.*"). Lastly, the *moralistic* dimension dealt with the moral-legal view on the treatment of birds (e.g., "*I am sometimes upset when I see birds in cages in zoos.*"). To maintain content validity, the scale was assessed by three biologists with research backgrounds in environmental psychology. These experts evaluated all items on the basis of content and language criteria. To ensure face validity, the scale was assessed for plausibility and credibility by laypersons. In addition, validity was tested by principal component analysis. The subsequent modification of the scale was also part of the quality measurement. Answers were inquired on a 5-point Likert scale ranging from "1 = *strongly disagree*" to "5 = *strongly agree*". We assumed that results with mean values greater than 3.5 indicated positive attitudes toward birds. Scores between 2.5 and 3.5 were judged as neutral attitudes toward birds. Furthermore, values smaller than 2.5 were interpreted as indicating negative attitudes toward birds (Prokop et al., 2010). In line with Prokop et al. (2010), the overall attitude scale was used as a measure of attitudes toward birds. The overall attitudes scale showed a high internal consistency, with a Cronbach's α value of 0.89.

3.7. Knowledge

In total, we used 20 items to test knowledge about birds (see supplemental material) that were similar to Kellert's (1993) knowledge test about invertebrates and bird knowledge tests from Prokop et al. (2008), Kubiatko and Balatova (2017), and Cardak (2009). Ten items were adapted from previous research, with only slight rewording (Cardak, 2009; Kubiatko and Balatova, 2017; Prokop et al., 2008). For example, the multiple-choice item "*Where does the white stork winter? a) Asia, b) America, c) Antarctica, d) Africa*" (Kubiatko and Balatova, 2017) was adapted to "*White storks usually migrate to Asia for the winter.*" The knowledge test was supplemented with items, taking into account Kellert's (1993) knowledge categories. All items covered one of five bird knowledge categories: (1) biological characteristics (15 items), (2) population and endangerment status (one item), (3) taxonomy (one item), (4) birds in agriculture and garden culture (two items), and (5) human endangerment (one item). Participants could answer each question as "*correct*", "*incorrect*", or "*I don't know*". The latter two responses were analyzed as false in the evaluation, resulting in a dichotomous

Table 2
Overview of Spearman bivariate correlations and descriptive statistics of the collected variables ($N = 579$).

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Gender[a]	–												
(2) Age	-.05	–											
(3) Education level	.04	-.32*	–										
(4) Income[b]	-.14*	-.07	.15*	–									
(5) Severity[c]	.12	.28*	-.10	-.03	–								
(6) Vulnerability[c]	-.03	.15*	-.04	-.03	-.02	–							
(7) Self-efficacy[c]	.06	.04	.04	.04	.38*	.01	–						
(8) Response efficacy[c]	.01	.16*	-.01	-.04	.58*	.08	.51*	–					
(9) Response barriers[d]	-.05	-.17*	-.01	-.09	-.27*	-.00	-.40*	-.31*	–				
(10) Knowledge	-.19*	.19*	.11	.10	.20*	.01	.20*	.20*	-.20*	–			
(11) Attitudes[e]	.08	.33*	-.10	-.06	.64*	.01	.48*	.57*	-.36*	.28*	–		
(12) WTD	.08	.07	.04	.04	.36*	.09	.38*	.34*	-.24*	.19*	.40*	–	
(13) Actual donations[f]	.15*	.12	-.02	-.03	.22*	.06	.13	.19*	-.21*	.04	.18*	.31*	–
Items	1	1	1	1	3	3	3	3	4	18 (20)	20 (24)	1	1
Mean value		49.15			5.06	3.51	4.10	4.74	2.85	10.93	4.03	3.75	27.59
Standard deviation		16.93			0.90	0.83	1.10	0.76	1.00	3.27	0.55	1.32	34.62
Median		49.00			5.12	3.33	4.00	4.67	2.75	11.00	4.10	4.00	10.00
Skewness		.01			-.89***	.03***	-.20*	-.14*	.24***	-.59***	-.61***	-.38***	1.07***
Kurtosis		-1.08***			.91*	1.02***	-.25	-.48***	-.41***	.45*	.04	-.26	-.18
K-S Test		.07***			.15***	.14**	.98***	.10***	.07***	.11***	.08***	.22***	.24***

Spearman Correlation Bonferroni corrected: *$p < .004$.
Significant skewness and kurtosis or a significant Kolmogorov-Smirnov test indicate non-parametric data; *$p < .05$, **$p < .01$, ***$p < .001$ (Field, 2018). Items indicates the number of items, and the number of the original scale is given in parentheses. This number indicates the number of items for the knowledge and attitude variables before items were selected based on item difficulty (knowledge) or principal component analysis (attitudes).

[a] A point-biserial correlation was calculated between a continuous and a dichotomous variable. 1 = men, 2 = women.
[b] 51 participants selected the option "no answer". This was treated as missing value ($N = 528$).
[c] Six-point Likert scale from "1 = *strongly disagree*" to "6 = *strongly agree*".
[d] Six-point Likert scale from "1 = *very unlikely*" to "6 = *very likely*".
[e] Five-point Likert scale from "1 = *strongly disagree*" to "5 = *strongly agree*".
[f] Sliding scale: 0–100 % in 1 % steps.

scale for correct (1) and incorrect (0) statements (Kellert, 1993). Achieving the maximum score of 20 points would indicate extensive knowledge about birds. 2 Items that were answered correctly by more than 80 % of the participants were excluded from the analysis, as they did not meet the criterion of medium item difficulty and were considered "too easy" (Moosbrugger and Kelava, 2012). Knowledge items answered correctly by less than 20 % of the participants would have been considered “too difficult”; however, none of these were identified in the present study. Without the excluded items, the maximum score possible was 18 points.

3.8. Statistical analysis

Statistical data analysis was carried out using SPSS® software (IBM® version 26). First, principal component analyses with varimax rotation were performed to examine the factor structure of the PMT variables. Beforehand, the suitability of the data for factor analysis was tested using the Kaiser-Meyer-Olkin criterion. All values were above 0.80; thus, the data appeared to be well suited (> 0.5) (Field, 2018). In addition, the reliability of the scales was analyzed using Cronbach’s α analyses. Furthermore, Bartlett’s tests for sphericity were significant ($p < 0.001$) for the aforementioned subcomponents. Thus, a factor analysis could be conducted (Field, 2018).

Next, we tested the distribution of our data using the Kolmogorov-Smirnov test (Table 2), Q-Q plots, and skewness and kurtosis. As the distribution was not normal, we used robust, non-parametric tests for subsequent analyses. First, we calculated Spearman correlations to investigate relationships between the variables. Effect sizes were calculated according to Cohen (1992). To account for multiple testing we used the Bonferroni correction for the correlational analysis (0.05/12; $*p < 0.004$). This was followed by hierarchical multiple regression analyses to examine the influence of the predictors on WTD and actual donations (Field, 2018). In the multiple hierarchical regression, we included the following variables: (1) sociodemographic variables, (2) PMT variables, (3) knowledge, and (4) attitudes (Table 3). In addition, the influence of WTD on actual donations was included (Table 4). This made it possible to calculate the explained variance of individual predictors.

4. Results

4.1. Descriptive statistics

The descriptive statistics of all variables are shown in Table 2. Regarding actual donations, a total of 319.49 € out of a possible 1158 € were donated, with 12.3 % ($N = 71$) of the participants donating 100 % of their reward, 16.6 % ($N = 96$) donating 50 %, and 38.5 % ($N = 223$) not willing to donate their reward at all (Fig. 2). On average, participants donated 27.59 % ($SD = 34.62$), or 0.55 €, of their reward. A total of 101 participants stated that they were willing to donate, but donated 0 % of their reward. Conversely, 14 participants who stated that they would not donate subsequently donated 100 %.

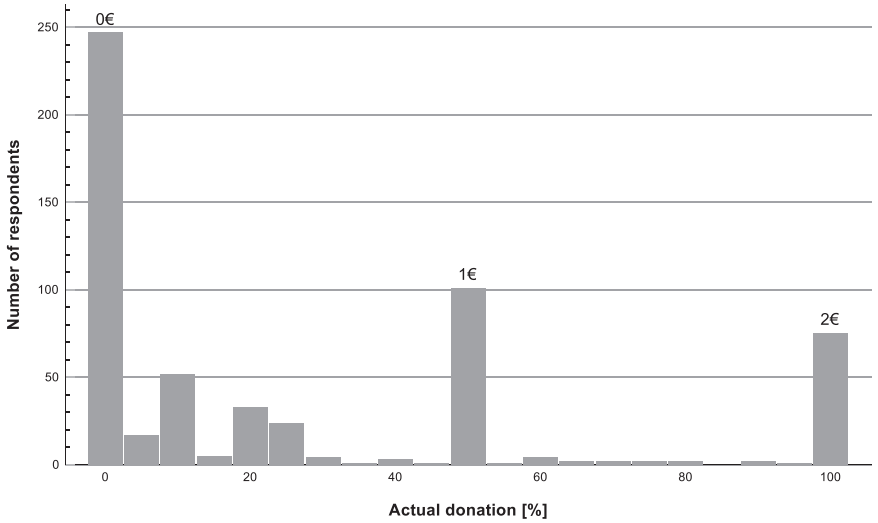

Fig. 2. Frequency distributions of actual donations toward bird conservation ($N = 579$). *Note:* Actual donations were recorded via the item "*What percentage of your reward for completing the questionnaire would you like to donate to the conservation of endangered bird species in Germany?*" The answer was collected on a stepless slider ranging from 0 % to 100 % in 1 % steps. In total, participants could donate a maximum of 2 € of their compensation for filling out the questionnaire.

4.2. Spearman correlation analysis

Table 2 shows the correlations between all collected variables. *p*–values were corrected according to Bonferroni. All independent variables except for the sociodemographic predictors showed a significant correlation with WTD (Table 2). Attitudes ($r = 0.40$; $p < 0.004$), *self-efficacy* ($r = 0.38$; $p < 0.004$), *severity* ($r = 0.36$; $p < 0.004$), and *response efficacy* ($r = 0.34$; $p < 0.004$) were all moderately positively correlated with WTD. With the exception of education, income, *vulnerability*, and knowledge, all independent variables significantly correlated with actual donations toward bird conservation in Germany. The strongest correlations with actual donations were observed for WTD ($r = 0.31$; $p < 0.004$) and *severity* ($r = 0.22$; $p < 0.004$), and *response barriers* ($r = -0.21$; $p < 0.004$).

4.3. Multiple hierarchical regressions

Overall, four of the eleven predictors showed a significant influence on WTD (Table 3). *Severity* (β = .14; 95 % CI, .05 – .36; $p < .05$), *vulnerability* (β = .13; 95 % CI, .07 – .31; $p < .01$), and *self-efficacy* (β = .13; 95 % CI, .05 – .27; $p < .01$) were identified as positive predictors. Attitudes had the greatest positive influence on WTD (β = .24; 95 % CI, .30 – .83; $p < .001$). In the first step of the multiple hierarchical regression, the sociodemographic predictors explained 1.1 % of the total variance in WTD. With the inclusion of the PMT constructs, another 18.8 % of the total variance could be explained. Additionally, attitudes and knowledge were able to explain another 2.8 % of the total variance. Overall, the model explained 22.7 % of the total variance in WTD toward bird conservation in Germany.

The regression model of actual donations showed that two predictors had a positive and one had a negative influence on donations. Being a woman (β = .16; 95 % CI, 5.53 – 17.44; $p < .001$) and *severity* (β = .12; 95 % CI, −.00 – 9.2; $p < .05$) had significant positive influences, whereas *response barriers* (β = −.18; 95 % CI, −9.3 – 3.04; $p < .001$) had a strong negative influence. By including the sociodemographic variables in the first step, 4.9 % of the total variance could be explained. With the addition of the PMT constructs, a further 6.6 % of the total variance was explained. The predictor's knowledge and attitudes could not explain more of the total variance of the donation. Overall, the model explained 11.3 % of actual donations toward bird conservation.

In a further regression model, the influence of WTD on actual donations was examined (Table 4). In this case, being a woman (β = .16; 95 % CI, 5.28 – 17.04; $p < .001$) and *response barriers* (β = −.17; 95 % CI, −8.94 – −2.75; $p < .001$) remained significant, but

Table 3
Multiple hierarchical regressions on WTD and actual donations toward bird conservation ($N = 528$).

		Willingness to donate			Actual donations		
Model	Variable	*B*	*SE B*	β	*B*	*SE B*	β
1	Constant	2.63	.38		-9.77	10.03	
	Gender	.19	.11	.07	13.27***	3.02	.19
	Age	.01*	.00	.11	.32***	.09	.15
	Education	.11*	.05	.09	.22	1.44	.01
	Income	.00	.01	.02	.16	.32	.02
2	Constant	-.27	.58		-25.12	16.36	
	Gender	.05	.10	.02	10.98***	2.96	.16
	Age	-.00	.00	-.03	.13	.10	.06
	Education	.08	.05	.07	-.24	1.40	-.01
	Income	.00	.01	.01	.07	.31	.01
	Severity	.34***	.08	.23	4.82*	2.15	.12
	Vulnerability	.18**	.06	.11	2.68	1.76	.06
	Self-efficacy	.22***	.06	.19	-.22	1.57	-.01
	Response efficacy	.16	.09	.09	3.38	2.55	.07
	Response barriers	-.10	.06	-.08	-6.30***	1.58	-.18
3	Constant	-1.28	.61		-28.32	17.62	
	Gender	.07	.11	.03	11.49***	3.03	.16
	Age	-.01	.00	-.08	.11	.10	.05
	Education	.07	.05	.06	-.49	1.42	-.01
	Income	.00	.01	.01	.05	.31	.01
	Severity	.20*	.08	.14	4.60*	2.34	.12
	Vulnerability	.19**	.06	.13	2.71	1.76	.07
	Self-efficacy	.16**	.06	.13	-.38	1.63	-.01
	Response efficacy	.06	.09	.03	3.22	2.63	.07
	Response barriers	-.07	.06	-.05	-6.17***	1.59	-.18
	Knowledge	.02	.02	.05	.42	.49	.04
	Attitudes	.57***	.14	.24	.41	3.93	.01
	*$p < .05$, **$p < .01$, ***$p < .001$	Willingness to donate:			Actual donations:		
		Model 1: adj. $R^2 = .011$; $\Delta R^2 = .011$; $p < .05$.			Model 1: adj. $R^2 = .049$; $\Delta R^2 = .049$; $p < .001$.		
		Model 2: adj. $R^2 = .199$; $\Delta R^2 = .188$; $p < .001$.			Model 2: adj. $R^2 = .115$; $\Delta R^2 = .066$; $p < .001$.		
		Model 3: adj. $R^2 = .227$; $\Delta R^2 = .028$; $p < .001$			Model 3: adj. $R^2 = .113$; $\Delta R^2 = -.002$; $p > .05$.		

Table 4
Regression model on actual donations toward bird conservation ($N = 528$).

	Actual donations		
Variable	*B*	*SE B*	β
Constant	-22.18	17.47	
Gender	11.16***	2.99	.16
Age	.14	.10	.07
Education	-.77	1.40	-.02
Income	.04	.31	.01
Severity	3.62	2.33	.09
Vulnerability	1.79	1.76	.04
Self-efficacy	-1.13	1.62	-.04
Response efficacy	2.94	2.56	.06
Response barriers	-5.85***	1.58	-.17
Knowledge	.32	.49	.03
Attitudes	-2.31	3.94	-.04
WTP	4.80***	1.26	.18

adj. $R^2 = .136$; $p < .001$; *$p < .05$; **$p < .01$; ***$p < .001$.

severity became insignificant. WTD (β = .18; 95 % CI, 2.32 – 7.26; $p < .001$) also showed a positive significant influence in this model, explaining a further 2.3 % of the total explained variance of 13.6 %.

5. Discussion

5.1. Willingness to donate and actual donations toward the conservation of endangered birds

In this study, the majority of respondents were willing to donate toward bird conservation and, in line with the PMT, their WTD had a significant positive influence on their actual donations toward bird conservation.

Our findings are consistent with several studies showing a similar positive WTD toward bird conservation for various bird species (Dallimer et al., 2013; Ferrato et al., 2016; Zander et al., 2014). Furthermore, the results on actual donations are similar to those of a comparable study by Dörge et al. (2022) on WTD and donations toward insect conservation, in which 61.9 % of the respondents donated an average of 0.56 € (of their 2 € reward). In contrast, in a survey on charity donations, 89.0 % of participants did not donate (Leliveld and Risselada, 2017). However, it was only possible to donate the complete reward in the previous study. Accordingly, a discretionary donation amount appears to be reasonable because both parties, participants and birds, benefit.

Although our model for WTD explained 22.7 % of the total variance, the final model for actual donations only explained 13.6 % of the variance in donations. Some predictors (*vulnerability*, *self-efficacy*, attitudes) only influenced WTD. Furthermore, only a small part of the total variance in actual donations was explained by WTD. This large discrepancy between intentions and actual behavior points to an *intention-behavior gap* (Ajzen et al., 2004; Kollmuss and Agyeman, 2002; Sheeran and Webb, 2016) between WTD and actual donations to the conservation of birds. Possibly, individuals are only moderately inclined to actually donate toward bird conservation. While the hypothetical decision-making situation elicits a positive reaction (a high WTD), this does not translate to actual behavior (i.e., actual donations are low; Campbell, 1963, cited by Ajzen et al., 2004; Benz and Meier, 2008). Additionally, the values and beliefs of the respondents may not be in line with the NGO (in this study: NABU). If there is a lack of congruence between individual and organizational values, it is likely that no donation will be made (van Dijk et al., 2019). In our case, WTD was inquired, without specifically mentioning an NGO, whereas the actual donation was explicitly dedicated to the NABU. Thus, for future studies, other psychological factors (e.g., values, beliefs) and external factors, such as credibility, transparency, political orientation, and organizational image of environmental NGOs, that may influence donation behavior should be investigated (Degasperi and Mainardes, 2017). It is also possible that a more specific indication of which protective measures the donation will fund (e.g., donations toward certain flagship species, reconstruction of nesting sites, renaturation of protected areas for birds) could influence donation behavior positively.

To shed further light on the gap between WTD and actual donation behavior toward the conservation of birds, it would be equally important to inquire about participants' reasons for not donating toward bird conservation, for example using qualitative interviews. Moreover, different donation types (e.g., one-time or annual) and donation scenarios (e.g., increasing environmental taxes to conserve endangered biodiversity) should be tested in experiment designs (Kamri, 2013; Kotchen and Reiling, 2000).

5.2. Influence of the studied predictors

5.2.1. Sociodemographic variables

We found that sociodemographic factors only explained a small part of the total variance in WTD and actual donations toward bird conservation, which is in line with previous research (Stern, 2000). Although gender did not influence WTD, contrary to our prediction, women donated significantly more of the 2 € than males (7.1 %). While some studies are supporting our hypothesis (Adamu et al., 2015; Dörge et al., 2022; Wang and Jia, 2012; Zander et al., 2014) there is also research showing that women report higher

interest in birds, more emotional engagement and concern for the environment, as well as stronger support for endangered animal species (Czech et al., 1998; Gifford and Nilsson, 2014; Hummel et al., 2015; Kollmuss and Agyeman, 2002; Mohai, 1992; Prokop and Kubiatko, 2014). Accordingly, tailoring future bird conservation donation campaigns to gender by selecting different flagship species (based on size, esthetics, and whether the bird is a songbird or a predator) might be effective.

Age had no influence on WTD or actual donations toward bird conservation in this study. Some previous studies have indicated that mainly older people donate to biodiversity conservation (Adamu et al., 2015), whereas others identified younger people as more willing to donate toward bird conservation (Dallimer et al., 2013; Ojea and Loureiro, 2007). Based on our results, it appears that age is not an important predictor of donation behavior toward bird conservation.

Similarly, the education level of participants did not influence their WTD or their actual donations toward bird conservation. In previous studies, it has been demonstrated that a higher level of education is associated with a higher WTD toward bird conservation (Adamu et al., 2015; Brouwer et al., 2008; Lundberg et al., 2019). However, these studies also included higher educational qualifications (e.g., attendance at a university or a university degree). Nevertheless, the results of this study indicate that education level plays a minor role in donation behavior toward bird conservation in Germany.

The assumption that the income of the participants would influence WTD and actual donations toward endangered bird conservation was not supported by the present results. Other studies have shown similar results regarding income (Cárdenas and Lew, 2016; Dallimer et al., 2013), indicating that people caring about biodiversity appear to donate more, regardless of income (Turpie, 2003). This implies for NGOs that people might donate toward bird conservation regardless of their income. However, one important consideration when it comes to income is household size as this might influence the income disposable for such donations. While this was not possible to disentangle based on the present data, future studies should collect this information.

5.2.2. Protection motivation theory variables

Of the PMT variables, *severity* had the strongest positive influence on WTD and also a positive influence on actual donations. Previous studies have identified *severity* to be important in explaining several pro-environmental behaviors (Bockarjova and Steg, 2014; Kim et al., 2012; Rainear and Christensen, 2017), conservation motivation toward the return of wolves to Germany (Hermann and Menzel, 2013), as well as on the WTD toward insect conservation (Dörge et al., 2022). To target *severity*, people should be made aware of threats toward birds through education campaigns. Intervention studies could investigate which factors increase the perceived *severity* of threats toward birds. Chen (2016) and Huth et al. (2018) examined the influence of perceived *severity* on pro-environmental behavior through fear appeals. Possible fear appeals may include deterrent images in advertising. However, it must be ensured that overly strong fear appeals do not deter the public, otherwise such tactics could have a negative impact on donation behavior.

Vulnerability appears to influence WTD, but not actual donations. In the present study, *vulnerability* was estimated to be moderate. It is possible that *vulnerability* does not function as a linear predictor, but instead a certain threshold needs to be reached for people to actually donate. This threshold could vary depending on expectations, background, and motives (Tveit et al., 2019). Factors that strengthen the perceived *vulnerability* of birds should be investigated to increase WTD. In practice, the endangerment of birds could be highlighted by focusing on the global threat toward birds and the loss of numerous bird species (Fančovičová et al., 2021).

Self-efficacy positively influenced WTD, but not actual donations toward endangered bird conservation. Our assumption that *self-efficacy* influences both intention and behavior can therefore only be confirmed for WTD. Previous studies have identified *self-efficacy* as a suitable predictor of pro-environmental intentions (Kim et al., 2012; Rainear and Christensen, 2017). Moreover, *self-efficacy* positively predicted intentions to support the conservation of wolves (Hermann and Menzel, 2013). Among adolescents, in particular, high *self-efficacy* can be associated with pro-environmental behavior (Meinhold and Malkus, 2005); therefore, future studies need to investigate this group. One option to increase *self-efficacy* in the context of donations is to describe the flow of money and provide testimonials from other donors (Kim et al., 2012).

Contrary to our theoretical assumption, *response efficacy* did not significantly impact WTD or actual donations. This could be explained by the finding that *response efficacy* indirectly influences WTD via *self-efficacy* (Shafiei and Maleksaeidi, 2020). Indeed, these two variables were strongly correlated in the present study.

Response barriers did not influence WTD, but negatively influenced actual donations toward bird conservation. Evidence from previous studies has indicated that *response barriers* negatively influence pro-environmental behavior and conservation motivation (Bockarjova and Steg, 2014; Hermann and Menzel, 2013; Rainear and Christensen, 2017). In the context of this study, *response barriers* might be attributed to a lack of trust in the NABU organization (Blake, 1999; Kollmuss and Agyeman, 2002). By showing transparent fundraising campaigns that highlight the accountability of organizations *response barriers* could be mitigated (van Leeuwen and Wiepking, 2013).

While not all PMT variables were predictors of WTD or actual donations toward bird conservation, they had a stronger influence compared to the other variables. The PMT predicts WTD toward bird conservation well (18.8 % of variance explained) and actual donations less well (6.6 % of variance explained).

5.2.3. Influence of knowledge

Similar to a study by Onel and Mukherjee (2016), factual knowledge about birds had no influence on WTD or actual donation behavior. Nevertheless, it may be important to distinguish between different forms of environmental knowledge: (1) system knowledge, which encompasses the general understanding of ecosystems, the organisms and mechanisms operating within them, and environment-related issues; (2) action-related knowledge, which relates to actions that can be taken to solve environmental problems; and (3) effectiveness knowledge, which relates to the usefulness of potential actions (Frick et al., 2004). In the present study, system

knowledge had no direct influence on donation behavior. It can be assumed, that action and effectiveness knowledge have a larger influence on behavior (Frick et al., 2004). Specifically, the convergence of different knowledge types could influence WTD and actual donations toward bird conservation (Kaiser and Fuhrer, 2003).

Moreover, multiple studies serve as examples of studies where knowledge also predicted conservation intentions and behavior (Cornelisse and Sagasta, 2018; Lundberg et al., 2019; Martín-López et al., 2007). Therefore, the influence of knowledge should not be downplayed. Although factual knowledge about bird biology might not play a role in donation behavior, other types of knowledge such as knowledge on action effectiveness, and other areas of knowledge may well play a role.

5.2.4. *Influence of attitudes*

Our results support the hypothesis that positive attitudes toward birds explain WTD, but not actual donations. This is in line with previous findings, as the effect of attitudes on actual behavior might be mediated by intentions (Ajzen et al., 2004; Pronello and Gaborieau, 2018). Previous studies have shown that individuals who reported stronger pro-environmental attitudes also showed a significantly higher WTD toward the environment and endangered species (Aldrich et al., 2007; Choi and Fielding, 2013; Dörge et al., 2022; Kotchen and Reiling, 2000). In the present study, the explained variance by attitudes is likely relatively small because attitudes were added in the third step of our regression model. Another study recently tested attitudes as an associated construct of the PMT and found that attitudes predicted pro-environmental behavior strongly (Shafiei and Maleksaeidi, 2020). In combination with the present findings, future research should investigate how attitudes influence the PMT constructs or vice versa; for example, via structural equation modeling.

This study surveyed general attitudes toward birds. To create a higher congruence between attitudes and WTD and actual donations, it would be important to survey specific attitudes toward bird conservation. While attitudes toward birds in general might be positive, attitudes toward bird donation might be more negative, which could explain the lessened effect. Despite the relatively low explanatory value of attitudes, promoting positive attitudes toward birds is likely a good idea because attitudes can be expected to positively influence the PMT constructs. Positive attitudes could be improved through education programs (Caro et al., 1994; Pooley and O'Connor, 2000). Furthermore, laypeople's attitudes toward birds could be increased through action measures and citizen science toward bird conservation (McCaffrey, 2005; Shipley et al., 2018; Tulloch et al., 2013), such as monitoring programs, or provision of nesting and feeding sites.

5.3. *Limitations of the study and further development of research*

Overall, our sample slightly deviates from the general German population, especially regarding education and income. Furthermore, as the panel had an age restriction, potential participants under the age of 18 years were excluded. Studies show that formal education in schools can be effective in promoting species knowledge or attitudes toward birds (Prokop et al., 2008; Randler, 2010), which could increase general engagement in bird conservation and have a positive effect on donation behavior.

In this study, the donation amount of 2 € was relatively small. Consequently, the results are not necessarily transferable to other donation campaigns with higher donation amounts. By asking for a percentage donation instead of a total sum, we attempted to distance the donation decision from the donation size. Nevertheless, the fundamental issue regarding small donation amounts remains. Future research could attempt to overcome this by focusing on higher donation amounts or by looking at actual donations made in the field. Investigating this could exaggerate the effects of potential predictors more clearly. In addition, the subjects were able to decide whether they would like to participate in the questionnaire based on the general topic "birds", thus, the participants were self-selected (Stein, 2014).

We assum that similar results as in our study, with Germany as a western country, might be translated to culturally similar countries with comparable biodiversity (Department for General Assembly and Conference Management, n.d.). This would, however, have to be verified in follow-up studies.

Another limitation was that we captured WTD using only one item. In the future, reasons contributing to a low WTD and causes of non-donation should also be investigated (Zander et al., 2014). Moreover, future studies should include questions concerning previous or planned donations, as those could influence current donation behavior negatively (Leliveld and Risselada, 2017).

Furthermore, mediator or moderator effects among knowledge, attitudes, and the PMT constructs, and their effects on WTD and actual donations, should be analyzed in more detail, thereby gathering information on causality among variables. In addition to the factors already surveyed, many others could influence donations. The investigation of other psychological factors (e.g., values, beliefs) and especially external factors (e.g., credibility, transparency, religious and political orientation, and organizational image of the environment) might help to foster donation behavior (Degasperi and Mainardes, 2017; Green and Webb, 1997).

Due to the *intention-behavior gap*, it must be assumed that intention and behavior are not consistent in the context of bird conservation. In follow-up studies, these discrepancies should be investigated more closely to identify factors promoting the congruence between WTD and actual donations to bird conservation. Finally, it is important to consider that people's behavior in the field might differ strongly from the research setting (Benz and Meier, 2008). Possible response biases such as social desirability could have inflated our results. Furthermore, actual donations could be surveyed across several NGOs involved in bird conservation to increase the likelihood of value congruence. Another perspective could be in reference to the targeted species. Specifically, donation behavior could also be investigated for umbrella species, such as selected flagship bird species that capture public attention; for indicator species, associated with an endangered community of bird sub species; or for focal species, which provide the impetus to conserve a particular community of birds (Caro, 2010; Primack, 2008).

The "attitudes toward birds" scale, was tested for the first time in the present questionnaire. Despite the good reliability scores and a

clear factor structure that corresponds closely to the theoretical assumptions, the scale should be continuously examined in follow-up studies assessing possible attitude dimensions, in order to differentiate further dimensions if necessary.

6. Conclusion

The present study aimed to explain donation behavior toward bird conservation by investigating factors influencing donations. Therefore, we investigated the influence of the PMT constructs, as well as knowledge, attitudes, and sociodemographic factors, on WTD and actual donations toward bird conservation. In addition to attitudes, the PMT variables *severity*, *vulnerability*, and *self-efficacy* were identified as predictors of WTD. Actual donations were predicted by gender, *severity*, *response barriers*, and especially WTD. Overall, the subcomponents of the PMT explained the majority of the variance in this study in both WTD and actual donations.

We believe that these results can be implemented in concrete biodiversity conservation measures. The results indicate that the perceived threat of birds and the associated consequences for people need to be more widely disseminated in society through educational conservation programs and awareness campaigns. Moreover, specific courses of action should be provided to improve *self-efficacy*. At the same time, anticipated *response barriers* should be lowered by creating transparent fundraising campaigns that make their successes recognizable to the general public. This could increase trust in organizations working for the conservation of birds.

To promote positive attitudes toward birds we suggest fostering direct interaction with species monitoring programs or participation in citizen science projects. In terms of conservation education, although factual knowledge about birds does not play a role, knowledge regarding action and effectiveness could have an influence on WTD and donation behavior toward bird conservation (Frick et al., 2004). To elucidate other influencing variables, conservation biologists should approach disciplines like conservation psychology (Primack, 2008) because it is necessary to raise awareness toward bird conservation so that NGOs are financially supported to conserve and restore the biodiversity of birds. A high level of motivation to conserve biodiversity is a prerequisite for the implementation of many biodiversity conservation measures.

Ethics approval

During our research, the authors, complied with the ethical guidelines for research with human participants set by Osnabrück University.

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CRediT authorship contribution statement

Annike Eylering: Conceptualization, Writing – original draft, Formal analysis, Visualization. **Milan Büscher:** Validation, Writing – review & editing, Visualization. **Jonas Boldt:** Conceptualization, Investigation, Methodology, Software. **Malin Funk:** Conceptualization, Investigation, Methodology, Software. **Florian Fiebelkorn:** Conceptualization, Investigation, Writing – review & editing, Resources, Supervision, Project administration.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Availability of data and material

The data is not published now, can be requested from the Corresponding author.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.gecco.2022.e02176.

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