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Motivations for birdwatching scale – Developing and testing an integrated measure on birding motivations

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Introduction: Birding has become a widespread, nature-related outdoor leisure activity. However, birding motivation has received little attention in research on this leisure activity so far. Since previous work showed some inconsistencies that are based on different measurements and concepts, the current study aimed at unifying and broadening the construct of birding motivation. For this purpose, we summarized the previous attempts to assess and categorize birding motivation and tried to unify them in one measurement model.

Methods: Starting point was a widely accepted model on outdoor recreation to which further dimensions have been added. We investigated birders (N=569) from German speaking countries regarding their birding motivations, birding specialization, and participation in various bird-related projects.

Results: Exploratory factor analysis revealed six motivation factors: Enjoyment had the highest scale mean, followed by achievement, conservation, detachment, social, and finally reputation. Confirmatory factor analysis showed a better fit of the posited six-factor model compared to the previous three-factor model supporting the initial concept of adding further scales to cover the motivational constructs more widely. Higher skilled, specialized and involved birders showed higher motivation in the dimensions conservation, social, and reputation. Conservation motivation was highly correlated with submitting observations to a citizen sciences portal and with participating in breeding bird surveys or waterbird counts.

Discussion: With our results, we expand the basic three-dimensional model of recreation motivation with the additional dimensions conservation, detachment, and reputation.

KEYWORDS

recreation specialization, motivation, birdwatching, outdoor recreation, nature-related outdoor activity

Introduction

Birding or birdwatching has become a widespread, nature-related outdoor leisure activity, often including some kind of travelling (Sekercioglu, 2002), reaching from a few kilometers to a local patch, up to hundreds of kilometers to chase for a special rare bird (Booth et al., 2011) and to special holiday trips, sometimes labelled "avitourism" (Conradie et al., 2013). Important about this leisure activity is, among other things, that birders support citizen science projects and submit their valuable data to online platforms (e.g., eBird), which helps to better understand avian ecology, and bird migration in particular, and contributes to conservation issues (Sullivan et al., 2014; Randler, 2021a). There are several reasons why it is important to understand the motivations underlying birding. First, we simply aim to understand the bases for human behavioral patterns, but second, understanding motivations also may have implications on conservation. For example, when social or affiliative motivation, like being with other people, is important for birding, then programs for citizen science participants may focus on a social relatedness. When it comes to competition, it may be useful to include competitive factors to address conservation (e.g., Larson et al., 2020).

However, birding is also a leisure activity that helps people to enjoy nature, restore their attention, recover from stress, and therefore, has a detachment function (Newman et al., 2014). In this article, we first draw on motivations and outdoor recreation, then moving toward birding and birding motivations, where we build upon a well-established model of outdoor recreation motivation, but also spotting its deficits and trying to improve the measurement of birding motivations.

There is no measurement agreed upon which helps to study such birder motivations, although some useful approaches exist. The purpose of this study was to integrate these approaches in one model of birding motivation. For this, we expanded a theoretical model on outdoor recreation (Decker et al., 1987) by taking into account further studies about birder motivations that were either based on this model or are ad-hoc developed measures. The overall objective of our study is broadening the motivational perspective on birding by adding more strength and rigor to measuring birding motivations. The first study (Randler, 2022) was based on 2,743 birdwatchers contributing to the data collection between 14 February 2020 and 15 June 2020, based on 14 questions derived from the model mentioned above (Decker et al., 1987). Afterwards, we applied additional questions to depict a more complex and integrative model of birding motivations (e., by incorporating the conservation aspect; Larson et al., 2020) which led to the data collection in another sample for this current study.

When participating in a leisure activity – whether outdoors or indoors – most people pursue different outcomes (Scott et al., 1999). The pursuit of such outcomes is related to the reason for action that determines the underlying motivation of an action.

Motivation, in turn, is a social psychological concept related to aspects such as basic needs and desired psychological outcomes (e.g., Ryan and Deci, 2017). From the perspective of self-determination theory (Ryan and Deci, 2017), motivation can be described as externally or self-determined. That is, motivation can be caused by external goals such as reputation and winning a competition or internal goals such as gaining new competences (Ryan and Deci, 2017). Whether an activity such as bird watching is subject to externally or self-determined motivational regulation depends on the degree of basic need satisfaction that the activity enables (Ryan and Deci, 2017). Ryan and Deci (2017) depict three basic psychological needs that are essential to human motivation, namely the needs for relatedness, competence, and autonomy. These needs describe that individuals want to perceive themselves as effective and connected to significant others in their environment (Reeve, 2015). Moreover, they strive to act voluntarily, to have choices in their actions and to be the origin of their own behavior (Reeve et al., 2003).

Concerning outdoor leisure activities in nature, motivation has been studied both in consumptive and non-consumptive outdoor leisure activities (Hinrichs et al., 2020). Although harvesting (fish or game) seems the obvious motivation of fishing and hunting, previous work showed that the motivations for fishing and hunting are also related to diverse social, psychological, emotional, and physical benefits (Hrubes et al., 2001; Hinrichs et al., 2020). To address different dimensions of motivation, Decker et al. (1987) proposed a three-dimensional model of wildlife-oriented motivation. Three dimensions have been found: 1) the *affiliative-oriented* that is related to the social side and, for instance, includes being together with others and reaffirm relationships, 2) a clear *achievement-oriented* (or competition) dimension that is based on a performance standard (e.g., against others but also against oneself; trophy hunting), and 3) the *appreciation-oriented* dimension that includes seeking peaceful nature and resulting stress reduction (Decker et al., 1987). This basically three-dimensional model is still used in current studies on leisure motivation (e.g., Ebeling-Schuld and Darimont, 2017; Randler, 2022). McFarlane (1994) adapted the Decker et al. (1987) model for birders. The achievement dimension (hunting for trophies in hunters) can be conceptually related to the "hunting" of bird species for different lists such as life lists, or year lists (McFarlane, 1994; Snetsinger, 2003; Randler, 2022).

The motivation of birdwatchers has been in the focus of previous research. These studies can be classified into those that were based on single items (Kellert, 1985; Hvenegaard, 2002; Eubanks et al., 2004; Sali et al., 2008), and studies that adopted strategies of scale development to classify and cluster items into different dimensions (McFarlane, 1994; Scott et al., 1999; Glowinski and Moore, 2014; Larson et al., 2020). Since the scale-based approaches are of particular importance to the current study, Table 1 summarizes and compares these

TABLE 1 Overview of the different dimensions of motivation in previous studies and the current study. For the current study, we also added the standard deviation.

	McFarlane (1994)	Scott et al. (1999)	Glowinski and Moore (2014)	Larson et al. (2020)	Randler (2022)	The current study
Country	Canada	USA	USA	USA	Germany	Germany
Dimension						
Achievement/ Competition	5.21‡	3.37†	3.15‡	2.83*	3.20	3.70 ± 0.76
Conservation	5.37‡	†	3.88‡	4.37		3.38 ± 1.19
Social	3.00‡	5.52	3.05‡	3.32	2.14	2.65 ± 1.02
Appreciation/ Enjoyment	5.26‡	6.11		4.08	4.10	4.28 ± 0.66
Detachment						3.19 ± 1.08
Reputation				2.62		1.77 ± 0.93

* labelled 'classic birding' in Larson et al. (2020); please note that the values can be only compared and ranked within a study, not among studies because of different scaling. ‡ summarized from original study; † these two categories were unified in Scott et al. (1999). Commitment and tradition (mean: 3.83) omitted from the Table (Larson et al., 2020). Mean values per study are given.

approaches. The different studies covered different dimensions of birding motivations (Table 1) that could be summarized under the headings achievement/competition, conservation, social/affiliative, appreciation/enjoyment, detachment and reputation.

The first German study on this topic basically confirmed the three dimensions of the Decker et al. (1987) model (Randler, 2022). Concerning further dimensions, McFarlane (1994) reported four dimensions, of which three were congruent with Decker et al.'s (1987) model. Her fourth dimension was labelled 'conservation' and included learning as well as contributing to science.

In participants of the Great Texas Birding Classic Scott et al. (1999) found an additional dimension of motivations: self-expression or identity.

By focusing on participants of a large citizen science program, the Christmas Bird Count (CBC), Larson et al. (2020) reported six dimensions (Table 1) with personal accomplishment as additional dimension related to reputation (e.g., gaining recognition from others). These additional dimensions have not been included in our previous study. In this study, we reviewed all previous items of the existing questionnaires (Table 1), and summarized them into the six categories. These categories were already suggested by the different researchers, but some hat overlapping constructs and items (see Table 1). For every category, we used the questions/ items that were available in the previous literature (Table 2). By this procedure, we follow the common procedure in evolving new measurements out of existing psychometric measure to improve questionnaire scales (see, e.g., Randler et al., 2016).

Birding specialization is different from motivations and it is based on the recreational specialization construct developed by Bryan (1977). Birdwatchers can be grouped alongside a continuum from the novice beginner to the highly specialized (Lee and Scott, 2004). The degree of specialization and,

therefore, the position on this continuum results is determined by the three dimensions knowledge/skill, behavior, and psychological commitment (Lee and Scott, 2004). Knowledge about the activity – in the case of birders, species

TABLE 2 Extended motivations for birdwatching scale based on Randler (2022).

What is your motivation for birding?

… seeing as many birds as possible. *	Kellert (1985); Hvenegaard (2002)
…seeing birds not seen before. *	Hvenegaard (2002)
…learning about bird habitats, behavior, and ecology. *	Hvenegaard (2002); ecology added by Randler (2022)
…to improve birding skills and abilities. *	Scott et al. (2005)
…because of esthetics aspects. *	Kellert (1985)
…personal fascination with birds. *	Kellert (1985)
…experience nature. *	Kellert (1985); Beardmore et al. (2011)
…escape daily routines (work, family, …). #	McFarlane (1994)
…to forget problems (or stress) at work. #	Sonnentag and Fritz (2007)
…have time to relax. #	Sonnentag and Fritz (2007)
…enjoy being alone. *	Beardmore et al. (2011)
…gain respect from other birders. *	McFarlane (1994)
…to be considered a good birder. *	McFarlane (1994)
…build friendship with other birders. *	McFarlane (1994)
…meet people who share my interest. *	McFarlane (1994)
…help others develop their birding skills. *	McFarlane (1994)
…contribute to societies' knowledge and understanding of birds. *	McFarlane (1994)
…collect data for nature conservation projects. #	Larson et al. (2020)
…document changes in bird populations. #	Larson et al. (2020)

*indicates that the items were used in the previous survey in another population (Randler, 2022). # newly added items.

identification – increases during "career stages" (Scott and Lee, 2010). Behavior is related to the number of birding trips and days in the field, while psychological commitment relates to the involvement and the lifestyle centrality in this activity (Randler, 2021b). Previous studies focused either on the specialization concept or on the motivation construct, although as early as 1992, McFarlane (1994) showed that achievement, affiliative, and social motivation dimensions were positively correlated to recreation specialization (McFarlane, 1994). Therefore, birding specialization was additionally collected in this study.

The first study on birding motivations in Germany (Randler, 2022) was based on 2,743 birdwatchers contributing to the data collection between 14 February 2020 and 15 June 2020 by answering 14 questions derived from the model mentioned above (Decker et al., 1987). Afterwards, we applied additional questions to depict a more complex and integrative model of birding motivations (e.g., by incorporating the conservation aspect; Larson et al., 2020) which led to the data collection in another, different sample for this current study. Thus, we summarize the previous attempts to assess birding motivation as well as integrating them into one integrative measurement model. Especially, we tried to separate the reputation/accomplishment from the social dimension by additional questions from Larson et al. (2020), and by focusing on conservation issues.

Materials and methods

Sample

Data were collected with the Online Research Tool SoSciSurvey in the German speaking countries Austria, Germany, and Switzerland from July to November 2021. On the first page, participants were instructed that the study was approved by an ethical committee and could be stopped at any time without consequences. Moreover, they were informed that participation was anonymous and voluntary. The study followed the European law for data protection. As a gift, we offered a 5 € voucher for an online bookstore. Additionally, we drew 27 book prizes in a lottery. Formal consent was asked for by clicking on a link ("Yes"). Participants were mainly recruited by regional and local chapters of organizations dealing with bird conservation and ornithology. The head of the organization was asked for distributing the link among their members. The data that support the findings of this study are available on request from the corresponding author (CR).

From the N = 569 participants of our study 386 (67.8%) were male, 177 female, 2 diverse and 4 preferred not to answer. Most participants reported at least a bachelor's degree from a university (n = 393; 69.1%). There were n = 552 respondents

from Germany, 14 from Austria, 3 from Switzerland. Mean age was 48.92 years (SD=17.16 years).

Questionnaires

Demographic data

The demographic variables used were participant's' age in years, their formal education (bachelor's degree or higher vs. no university education) and their gender (male, female, diverse, prefer not to answer; this gender question followed the standard procedures suggested for German studies).

Birding motivations

We applied 19 items to assess the participants' birding motivation that we collected from previous studies but expanded and rephrased them. Table 2 shows all the questions used in this study and their origin. All items were on a five-point Likert-scale; coded from 1 = fully disagree; 2 = partly disagree; 3 = undecided; 4 = partly agree to 5 = fully agree. A high agreement reflects high motivation. None of the items was reverse coded.

Birding specialization

Birding specialization was measured with previously published scales (Randler, 2021b). The specialization construct encompassed three dimensions: *skill/knowledge* contained the number of species being able to identify by sight without the help of a field guide: up to 25, 26-45, 46-100, 101-250, 251-500, >500; the number of species being able to identify by sound: up to 5, 6-10, 11-25, 26-80, 81-150, >150, and a self-classification from novice (1) to expert (5). Cronbach's α was .88. *Behavior* was measured by the number of birding excursions per year, at least two kilometers away from home: scaled from none, 1-2, 3-10, 11-35, >35; days with birding activity: none, <10, 11-30, 31-70, 71-200, >200. Cronbach's α was .62. Finally, *psychological commitment* was measured by three questions on a five-point Likert scale from 1 = fully disagree to 5 = fully agree. These items state that other leisure activities are less interesting, that birding is preferred in comparison to every other leisure activity, and that if one couldn't go birding, he/she would not know what to do else. Cronbach's α was .79. For the total scale, Cronbach's α was .84.

Participation in citizen science projects

To assess participation in citizen science projects, different projects were offered in a table and participants were asked for how often they had participated in the depicted activities. Response categories were: never, once, 2-3, 5-10, >10 times. Citizen science programs of different complexity and engagement were summarized in the table: NABU winter birds/garden birds (1 hour of observation), waterbird counts and breeding bird survey (usually some counts per year, in

different years), erecting and cleaning nest boxes, ringing programs, and the participation in field trips. As web-based platforms are increasing, we asked for the number of observations submitted to these platforms per year: none, <10, 11-50, 51-100, 101-200, 201-500, 501-1000, 1001-2000, >2000 (refined from Randler, 2021a).

Statistical analyses

We used an exploratory factor analysis with principal component factor extraction and oblique rotation (oblimin). Eigenvalues > 1 were inspected and used for the decision how many factors should be extracted. Correlations between the variables were either Pearson's correlation for metric data (specialization, motivations) or non-parametric for ordinal data (participation in citizen science projects). We used SPSS 27 for all calculations except the model fitting. For model fitting in a comparative factor analysis (CFA), we used MPLUS. Multiple indices were used to evaluate goodness of fit (Bentler, 1992): the root mean square error of approximation (RMSEA < 0.10), the comparative fit index (CFI > 0.90), and standardized root mean square residual (SRMR < 0.10), and the Tucker-Lewis Index (TLI >0.95; Cangur and Ercan, 2015). For the detailed discussion of our results, we consider only correlation coefficients above 0.2.

Results

The exploratory factor analysis (EFA) was conducted on the 19 items. The Kaiser–Meyer–Olkin measure verified the sampling adequacy (KMO = .76), whereas Bartlett's test of sphericity (χ^2 (171) = 4698.64, p <.001) indicated that correlations between items were sufficiently large for factor analysis. Six factors with an Eigenvalue >1 emerged (4.47, 2.74, 2.13, 1.67, 1.33, 1.05). These factors explained 70.5% of the variance. Table 3 shows the factor loadings after rotation.

The six factors were labelled Conservation, Detachment, Competition/Achievement, Enjoyment, Social, and Reputation. The cross-loadings are all below 0.3 (Table 3) which shows that the six dimensions are all independent from each other, and that they cannot be grouped into the previous three-factor model. Rather, these additional factors are separate psychological constructs. One exception is the item "…learning about bird habitats, behavior, and ecology", which shows higher cross-loadings. Enjoyment had the highest scale mean, followed by achievement, conservation, detachment, social, and finally reputation (Figure 1). The differences were significant between enjoyment and achievement (paired t-test, t= 15.07, p <0.001), between achievement and conservation (t=5.646, p <0.001), conservation and detachment (t=3.081, p = 0.002), detachment and social motivations (t= 9.424, p <0.001), and finally, between social and reputation (t=19.628, p < 0.001).

TABLE 3 Pattern matrix after rotation and internal consistency (Cronbach's alpha) of the motivations for birdwatching scale. .

	Conservation α = .87	Detachment α = .85	Competition/Achievement α = .66	Enjoyment α = .62	Social α = .82	Reputation α = .85
…document changes in bird populations.	**.913**	.022	-.066	-.012	.082	.079
…collect data for conservation.	**.877**	.132	-.020	-.107	.025	.044
…contribute to the knowledge of birds.	**.790**	-.014	-.012	.011	-.148	.055
…escape daily routine.	-.021	**.888**	.076	-.105	-.032	-.033
…forget problems at work.	.053	**.880**	.057	-.086	.012	-.001
…having time to relax.	.015	**.822**	.006	.085	-.083	-.061
…enjoy solitude.	.079	**.655**	-.058	.201	.110	.137
…species never seen before.	-.164	.068	**.812**	-.059	-.014	.155
…see as many species as possible.	-.043	.034	**.780**	-.103	.061	.212
…improve birding skills.	.061	.060	**.678**	.094	-.138	-.154
…learn about ecology, habitat, and behavior.	.355	-.130	**.443**	.259	-.019	-.390
…personal fascination.	.022	-.047	-.004	**.859**	.010	.107
…esthetics.	-.080	.043	-.024	**.809**	.030	.069
…enjoy nature.	-.088	.241	-.027	**.437**	-.111	-.277
…meet people with same interest.	-.064	.008	.026	-.018	**-.941**	.001
…build friendship.	-.097	.009	.056	.015	**-.893**	.128
…help others in their development of skills.	.391	-.007	-.103	-.029	**-.615**	.033
…gain respect.	.090	.046	.144	.092	-.171	**.787**
…be considered a good birder.	.196	-.011	.163	.097	-.111	**.783**

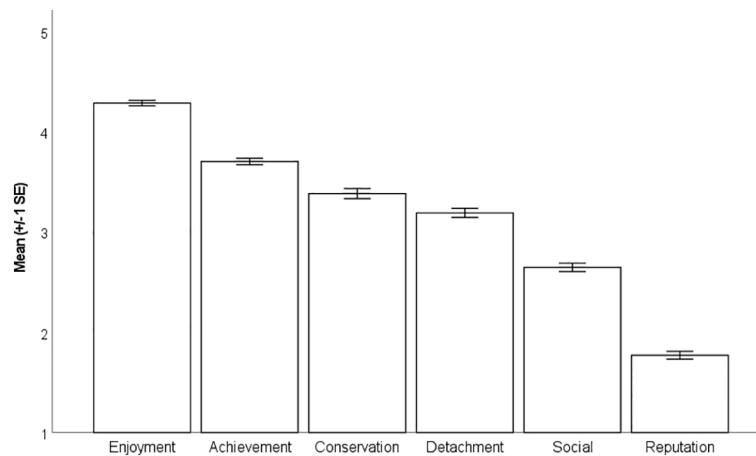Highest factor loadings are shown in bold.

FIGURE 1
Means and standard errors for the motivation dimensions of the motivations for birdwatching scale.

In addition, enjoyment and achievement had the smallest standard deviations, while they were larger in the other dimensions (see Table 1).

The correlations among the six dimensions of birding motivations are depicted in Table 4. Most dimensions were not correlated or with an coefficient below 0.2. Conservation was negatively related to social motivations, enjoyment and detachment were positively correlated, and finally, achievement motivations was negatively correlated with social motivations.

The comparison of the three versus the six-factor model based on a CFA is depicted in Table 5. All values show that the three-factor model is inferior against a six-factor model. Based on the criteria of Schermelleh-Engel et al. (2003) the three-factor model would not be acceptable in terms of goodness of fit, while the six-factor model has an acceptable to good structure.

Correlations with birding specialization showed that higher skilled and involved birders showed a higher motivation in the dimensions conservation, social, and reputation (Table 6). That means that birders with a high knowledge and a high commitment are more motivated because of conservation, reputation, and social motives (such as being with friends). Conservation motivation was highly correlated with

submitting observations to a citizen sciences portal and to participating in breeding bird surveys or waterbird counts. Thus, interest and motivation for conservation may lead to engagement in such projects. Reputation motivation was mainly related to number of observations submitted to web-based platforms. This suggests that birders mainly driven by their reputation indeed provide more observations to web-based platforms to display their competence. Social motivations was merely related to participation in field trips. This means that birders being motivated socially may provide observations to web-based platforms to inform others about birds recorded, but also their social life is centered around birds, and that they enjoy field trips with others (probably because they are more social). Achievement motivation was associated to garden bird counts and field trips. Enjoyment and detachment motivation were unrelated to citizen science activities.

Discussion

The current study aimed at summarizing and integrating dimensions of previous research on leisure activity motivation in

TABLE 4 Correlations among the six dimensions of motivations.

Motivations for Birding	1	2	3	4	5	6
1 Conservation	1.000	.074	.081	.084	-.269	.091
2 Detachment	.074	1.000	.118	.256	-.116	.071
3 Achievement	.081	.118	1.000	.137	-.242	.116
4 Enjoyment	.084	.256	.137	1.000	-.147	-.168
5 Social	-.269	-.116	-.242	-.147	1.000	-.146
6 Reputation	.091	.071	.116	-.168	-.146	1.000

TABLE 5 Comparison of model fit parameters for 3 versus 6 factor model.

	3 factor model	6 factor model
Robust Comparative Fit Index (CFI)	0.557	0.886
Robust Tucker-Lewis Index (TLI)	0.491	0.858
Robust RMSEA	0.155	0.082
RMSEA 90% CI	0.149; 0.161	0.075; 0.088
SRMR	0.143	0.077

one measurement model. Our results confirmed the three basic dimensions of the Decker et al. (1987) model with the three components enjoyment of nature, achievement, and social affiliation (see Randler, 2022). The model fit procedure clearly showed that a three-factor model is inadequate based on the model fits Thus, the six-factor model received good support from the explorative analysis with an EFA, and, subsequently, from the CFA. We are the first authors to show that this six-factor solution is an adequate model fit for assessing birding motivations. Further, the novelty of this study is the use of a CFA and the comparison of model fits and the integration of all previous constructs (Table 1) into one comprehensive scale. We were further able to separate the enjoyment of nature from the detachment dimension. This separation is important since nature can serve as both a positive source of enjoyment, but also as detachment as it allows people to forget their everyday problems, and helps in stress recovery, an aspect that was already addressed by Decker et al. (1987) but non formalized in a separate dimension. The newly emerged dimension of detachment is considered as independent because it is more closely related to factors such as relaxation or restoration, with a primary focus related to the attention restoration theory (e.g., Crossan and Salmoni, 2021). However, detachment was

correlated with the enjoyment dimension, which may lead to a rethinking of these dimensions. Nevertheless, both EFA and CFA currently suggest that these dimensions are separate.

Moreover, we were able to confirm a separate conservation dimension in line with the work of McFarlane (1994), Glowinski and Moore (2014), and Larson et al. (2020). Since citizen science projects become increasingly popular, being able to assess conservation motivation may help to identify target populations and recruit them for such projects. Conservation motivations was negatively correlated with social dimensions. This is interesting, because it suggests that conservation motivations emerged out of some need to take action, rather than being induced by social interactions. Conservation motivation was highly correlated with birding specialization, submitting observations to a citizen science portal and to participating in breeding bird surveys or waterbird counts. As birding specialization is some kind of career progress from the beginner to the specialist (Scott et al., 1999), we assume that the relationship might be predicted by the birding specialization concept. In the case of conservation, we assume that a high knowledge about birds and a high commitment to birding leads to conservation concerns. This may also result in specialized birders feeling obliged to participate in breeding bird surveys and waterbird counts. In addition, the high conservation motivation may also lead to reporting a high number of observations to citizen science platforms, because these data can be used for conservation (Randler, 2021a).

Finally, we identified reputation as a dimension that is different from the social dimension, which was found by Larson et al. (2020). One concept that addresses this dimension is introjected motivational regulation in the sense of self-determination theory (see Ryan and Deci, 2017). Actions that are based on introjected regulation are executed to protect one's own self-worth (Assor et al., 2009). However, two types of

TABLE 6 Relationships between the motivation dimensions, birding specialization, and participation in different activities (N = 569).

Motivation dimension	Specialization	NABU winter birds/garden birds	Surveys (waterbirds, breeding birds)	Ringing programs	Nest boxes	Participation in bird field trip	Observations in platforms
Conservation	.466**	.150**	.487**	.225**	.231**	-.061	.480**
	<.001	.000	.000	.000	.000	.143	.000
Detachment	.109**	.066	.043	.029	.024	-.015	.125**
	.010	.114	.307	.485	.570	.716	.003
Achievement	.097*	.100*	-.052	.069	-.004	.162**	.078
	.020	.018	.215	.100	.930	.000	.065
Enjoyment	.075	.056	.033	-.031	.051	-.017	-.071
	.074	.181	.435	.456	.222	.692	.092
Social	.222**	.197**	.175**	.131**	.174**	.274**	.203**
	<.001	.000	.000	.002	.000	.000	.000
Reputation	.305**	.113**	.170**	.175**	.102*	.083*	.342**
	<.001	.007	.000	.000	.015	.047	.000

Specialization was analyzed with Pearson's correlation, other variables were analyzed with Spearman rank correlation. ** indicate $p < .01$; * indicates $p < .05$.

introjected regulation are distinguished of which only one reflects the reputation dimension: introjected approach and introjected avoidance regulation (Assor et al., 2009). While avoidance regulation aims at avoiding low self-worth and feelings of shame and guilt, individuals with an approach regulation pursue the goal of social approval and a high self-worth (Assor et al., 2009). Introjected approach regulation may be expressed in the desire for reputation. As we found a relationship between reputation motivations and birding specialization, we assume a causal relationship, namely that birders first have to gain substantial knowledge and birding behavior before they can be motivated by reputation, e.g., being dependent on gaining respect from others.

Concerning the previously established dimensions, we found that social motivations was negatively related to achievement. This can result from the fact, that achievement may be seen and understood as some kind of competition between birders, which therefore, should be related to a less social motivation.

One question remains, namely, why these additional dimensions cannot be regrouped into the already existing model of Decker et al. (1987) with a three-factor structure. For example, the scales social and reputation both consider social aspects in the widest sense, and also, detachment and enjoyment may be grouped in the same dimension. However, the low cross-loadings of the exploratory factor analysis clearly suggest that these are separate psychological constructs; further, the correlations between the six different dimensions revealed by the EFA (Table 4) are rather low, supporting their independence. In addition, our CFAs clearly support the six-factor solution over the three-factor solution, thus, the six-factor solution is the better one. Also, the item "…learning about bird habitats, behavior, and ecology" showed high cross-loadings. This could lead to further refinements of the scale by dropping this item and adding new items to cover the motivational constructs in even more detail. Going further, as enjoyment and detachment motivation were largely unrelated to citizen science activities and birding specialization, it might be questioned whether these dimensions should be dropped in favor of more birding-related dimensions.

Regarding the extracted dimensions, birders reported the highest motivation for enjoyment (Figure 1; see also Sali et al., 2008; Randler, 2022). In Canada and the USA, the highest scores were found in conservation (McFarlane, 1994; Glowinski and Moore, 2014; Larson et al., 2020). In the present study, conservation motivation had only the third highest values. These results give hint for the assumption that there are differences between countries/regions. Probably, more importance is attached to conservation, and it may has a longer tradition in North America than in German speaking countries. However, the study by Larson et al. (2020) was carried out with participants of the CBC who might already have a high motivation for conservation when participating. Similar to Larson et al. (2020), we found the lowest motivation in the reputation dimension. This suggests that reputation is only of minor importance for birdwatching, despite the fact that people may participate in rankings and listings (e.g., Snetsinger, 2003).

Correlations between the motivation dimensions and specialization levels were found for the conservation, social, and reputational dimensions that are comparable to McFarlane (1994). Conservation motivation was highly correlated with the survey projects, bird ringing, caring for nest boxes and submission of records. This suggests that experienced birders may feel obliged to put their knowledge into service for society and conservation. Also, reputation motivation was correlated with specialization and submission of observation. Thus, highly knowledgeable people seem to strive for a high reputation. Reputation is associated with web-based ornithological platforms, in a way that people submit to these platforms because they gain reputation benefits, probably directly or later when they meet in the field. Interestingly, enjoyment of nature and detachment as motivation dimensions seem to be constructs that are different from participation in the various citizen science projects. They might be unrelated to these projects because these projects resemble some kind of work. One question may arise why we kept birding specialization and motivations as different constructs despite some moderate correlations. First, the two psychological constructs are derived from different theories or concepts, namely based on a motivational theory, and the recreation specialization construct. Second moderate correlations also exist in independent dimensions of personality (e.g., in the correlation between conscientiousness as a Big Five dimension and in Morningness; see Randler et al., 2016) but nevertheless, the constructs are considered as independent. Thus, just showing a correlation does not justify in merging psychological constructs.

Conclusion and application

Our study provides evidence for the basic three-dimensional model of recreation motivation (Decker et al., 1987) and expands the model by adding conservation, detachment, and reputation as additional dimensions. Our measurement is applicable to a wide range of birdwatchers, because it is much more specific and tailored than other more generic recreation motivation scales such as the Recreation Experience Preferences Scale (Manfredo et al., 1996). In comparison to such generic recreation motivation scales (Manfredo et al., 1996), the new comprehensive and integrative measure is especially tailored toward birding. Further, its 19 items keep it relatively short while still providing lots of information in six dimensions. We suggest the translation and application of this scale in different languages and geographical areas are important desiderata for future studies to get a more comprehensive view on birding motivations.

The scale can be applied to measure birding motivations, and as we have previously summarized (Table 1) birding motivations differ in a wide range of dimensions. Thus, the

scale measurement can be applied when assessing motivations in citizen science projects, or in developing such projects that are tailored toward differing levels of birding, such as programs for beginners, as well as complex programs with a sustained engagement in citizen science projects, like the CBC (Larson et al., 2020). Our integrative motivational scale may be also important for web-based platforms for data collection to know what motivates birders to implement functions to enhance data contribution and quality. For example, if birders are motivated by competition, the ranking of birders (as it could be done in eBird) is an essential tool to increase participation. When people are more motivated by their own achievements, tools like one's own year list in comparison to the last year or similar tools might be helpful. If social motivations is the primary motivational trigger, then birding programs that foster personal exchange (via social media or *via* in-person meetings) may be useful. It may be also important in planning or rethinking conservation campaigns because diverse types of birders can be motivated by different dimensions (Table 6), for example, when higher birding specialization is related to a higher conservation motivation, it may be useful to portray this by using different flagship species. Usually, higher specialized birders prefer other birds than novices (Randler et al., 2022). When it comes to the enjoyment of nature and the detachment function, such motivations may lead to a rethinking and refining or field trips – compared to the usual birding trips with a high pace, some more therapeutical ornithological aspects may become important, with a focus on a lower pace and on fewer species (Murawiec et al., 2021). Thus, the usefulness of our development spans a wide range of birding.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was granted permission by the ethics committee of the University of Bielefeld (2021-121 from 21.5.2021). Respondents were informed about the study, data protection rules following European law and had to actively click on a "Yes" to start the participation. The participants provided their written informed consent to participate in this study.

Author contributions

CR and NG designed the study, made the data collection, and wrote and reviewed the paper. CR made the statistical analyses. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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