

2. Materials and Methods

2.1 Hypotheses

In accordance with the research questions posed, the following hypotheses have been formulated:

Research Question 1: Are attitudes towards wolf recovery in Germany changing over time?

- H0a: There will be no significant change in the number of positive and negative attitudinal expressions towards wolf recovery in Germany in total publications over the examined period.
- H1a: There will be significant change in the number of attitudinal expressions in total publications towards wolf recovery in Germany. Negative attitudinal expressions will increase over time.
- H0b: There will be no significant change in the number of positive and negative attitudinal expressions of wolf return to Germany in national publications over the examined period.
- H1b: There will be significant change in the number of attitudinal expressions in national publications towards wolf recovery in Germany.

Rationale: The rationale of differentiating between total publications and nationwide publications is that H1a allows for an analysis across all newspapers collected from all over the country. This can include regional and local newspapers as well, and it represents the complete range of articles,

whereas for H1b, the samples were extracted from nationwide newspapers only. Nationwide newspapers have a broader readership and therefore tend to cover a wider spectrum of topics and area range and may therefore represent the more general public.

Research Question 2: Is there a difference in attitudes towards wolves in regions with no wolves and no wolf experience, some wolves and short wolf experience or many wolves and long wolf experience over time?

- H0a: There will be no difference in the time trend of positive and negative attitudinal expressions between the three regional groups.
- H2a: There will be a difference in the time trend of positive and negative attitudinal expressions between the three regions.
- H0b: There will be no difference in positive and negative attitudinal expressions between the three regional groups.
- H2b: There will be a difference in positive and negative attitudinal expressions between the three regions.
- H0c: There will be no interaction between the two factors 'region' and 'time'.
- H2c: There will be an interaction between the two factors 'region' and 'time'.

Rationale: The local newspapers are publications that focus on very specific regions and therefore represent attitudes of the public that specifically lives in that area rather than nationwide attitudes.

2.2 Sampling of newspaper articles

The news articles used for this analysis have been downloaded from the online database Nexis Uni® and can be viewed in Appendix A. Nexis Uni® is a part of LexisNexis®, which has the largest database of electronically available news articles and is widely and commonly used for media analyses (Bengston et al. 2005). The search included news stories on the topic of wild wolves in Germany, which were available online and published

between January 1, 2010, and December 31, 2020. An analysis of the past decade of wolf recovery in Germany was established, as wolves had some time to expand their range and people had time to grow aware of the new inhabitants. It also allowed for a larger number of articles to accumulate. All publications originated from newspapers that have been publishing continuously over that time span. This will ensure that the results reflect shifting public opinions rather than resulting from changes in group composition. Over the set time period of 2010 to 2020, there were $n=76$ sources of newspapers and newswires combined originating from Germany as per Nexis Uni. Having checked for discontinued publication, all 76 publications were useable for this study. This study combines all types of published articles, from news articles to opinion pieces and readers' letters. The search command aimed at targeting as many news articles as possible related to wolf recovery in Germany. Initially, there were over twelve thousand articles found by the search code. After further narrowing down by search criteria (see Appendix B), the result yielded $n=7053$ news articles, of which $n=6234$ (88.39 %) originated from newspapers and $n=819$ (11.61 %) from newswires and press releases. A review of $n=1000$ articles yielded into an accuracy rate of 86.14 % $((V_A - V_O) / V_A * 100$, where $V_A =$ accepted value, $V_O =$ observed value). The total number of articles was uploaded into the NVivo Pro 12 software without further filtering. The articles were uploaded as files (not cases). When opening the files later during the coding procedure, misidentified stories, as well as irrelevant attachments of articles that were uploaded with some files, were omitted, thereby further increasing the accuracy of relevant news stories. The final database of German print media contained $n= 5356$ articles.

For all samples taken, the appropriate sample size was calculated $([z^2 * p(1-p) / e^2] / [1 + (z^2 * p(1-p) / e^2 N)])$ where N = population size, z = z-score, e = margin of error, p = standard deviation; confidence level = 95 %.) Then samples were added with the goal to either reach an even number of samples over the period, i.e., through random sampling, or to spread the samples evenly over each year, i.e., stratified random sampling. The appropriate minimum sample size for hypothesis 1a was $n=358$ and was extended to $n=550$, in order to spread the samples evenly over the period. So, the total number of the sample size for hypothesis 1a was $n= 550$ and

reached across all available newspapers. Here, a stratified random sample was possible, leading to a sample size of n=50 articles/year. Hypothesis 1b required a sample of n=99. Thus, a stratified random sample of n=110 was taken from all national newspapers to match n=10/year. Hypotheses 2a–c required samples from Berlin, Saxony-Anhalt and North Rhine-Westphalia. Berlin had a calculated sample size of n=146. The sample was rounded up to 150. It was not possible to take a stratified random sample here, due to the low number of articles especially at the beginning of the period. Therefore, a simple random sample was extracted from all Berlin samples. It was partially possible to take a stratified random sample for Saxony-Anhalt and North Rhine-Westphalia, except for Saxony-Anhalt in 2010, as there was n=0 publications available for that year. Comparing samples from North Rhine-Westphalia (NRW) to samples from Saxony-Anhalt (ST) allows for an examination of regional differences, whereby NRW is a region where wolf return is relatively new, and ST is a region that has a long wolf history. It also includes an aspect of urbanity versus rural landscapes, as North-Rhine-Westphalia has a high population density (526 residents/km²), and the population density of Saxony-Anhalt is the third lowest of Germany with 107 residents/km² (Statista 2021). All samples were chosen by use of Python 3.9.

2.3 Analysis

Prior to hypotheses testing, the data was quantified to provide an in-depth visualisation of the single samples. A linear regression analysis was performed to test the time trends for attitudinal expressions towards wolf recovery in Germany. In order to compare the differences between regions with different levels of wolf presence in Germany over time, a two-way analysis of variance (ANOVA) was performed and graphically visualised for comparisons. All data were analysed using Excel from Microsoft 365.

2.4 The Classification System and Codebook

An investigation into how attitudinal expressions towards wolves trend over time in Germany requires a classification system to sort the articles into superordinate categories. The chosen categories were 'year', 'title', 'newspaper' and 'region'. A codebook of attitudinal expressions was developed based on the generic terms 'attitudes', 'beliefs' and 'judgments' following Eagly and Chaiken (1993). An iterative deductive-inductive approach was taken to create the categories of attitudinal expressions used for the coding system. After researching possible categories from past literature (Gosling et al. 2019; Houston et al. 2010), a list of categories was created that were relevant to the analysis. For the refinement of the categories, a random sample of $n=10$ articles from each year were examined and the evaluative expressions that appeared repeatedly in these news stories were analysed and led to a redefinition of the categories. Where possible, each category received a positive and a negative counterpart, distinct to its definition. 'Attitudes' was separated into the subcategories 'wolves are good and welcome' and 'wolves are bad and unwelcome'. 'Beliefs' included the largest number of evaluative categories. These were 'wolves are harmful to humans and disrupt human activity' and its opposite, then 'cattle need better protection', 'cattle is well-protected' and 'wolves kill livestock'. The last belief-category was 'wolves cause ambivalence/polarization/uncertainty'. This last-named category, as well as 'wolves kill livestock', derived inductively, as there was a noticeable focus on this topic within the publications. Another category pair included 'wolves negatively impact ecosystems' and its counterpart. Judgment categories included 'wolves should be killed or controlled' and 'wolves should be managed/protected/introduced'. All coding rules were equally applied to all regions coded for and can be viewed in Appendix B.

2.5 Reliability and Validity

According to Mackey and Gass (2005), reliability can be achieved by the same researcher by using the test-retest method. After having coded all the data, the first four years of the $n=550$ sample across all newspapers, as

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well as the first four years of the n=110 sample across all nationwide newspapers was recoded eight weeks after original coding and a correlation analysis was performed. There was a strong correlation with the recoded data (Appendix C), hence the analysis was continued. As for validity testing, it has been recognized that external audits provide a proper solution for this matter (Creswell, J.W. 2012), which includes the 'peer review' by submission to a reputable scholarly journal.