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A Fairy Tale Gold Standard. Annotation and Analysis of Emotions in the Children's and Household Tales by the Brothers Grimm

Abstracts

We present a quantitative study of textually encoded emotions in a core set of the Grimms' *Children's and Household Tales*. As a contribution to *Computational Literary Studies*, we publish (a) a fairy tale corpus (*ChildTale-A*) with more than 5,000 manually annotated sentences and introduce (b) four aggregated measures for the analysis of textually encoded emotions (*Average Valence*, *Emotional Potential*, *Emotional Arc*, and *Emotion Profile*), with which we (c) analyze the corpus with regard to the purported cruelty vs. optimism of fairy tales. On average, the fairy tales contain more than 50 % emotional sentences without clear negative sentiment, while emotion trajectory patterns vary. Together, these findings underscore the role of emotions as plot-driving elements in fairy tales as a highly schematized historical genre.

Wir stellen eine quantitative Studie textuell enkodierter Emotionen eines Kernsatzes der Grimmschen *Kinder- und Hausmärchen* vor. Als Beitrag zu den *Computational Literary Studies* publizieren wir (a) das *ChildTale-A* Korpus mit mehr als 5.000 manuell annotierten Sätzen, und stellen (b) vier aggregierte Maße zur Analyse textuell enkodierter Emotionen (*durchschnittliche Valenz*, *Emotionspotenzial*, *Emotionsverlauf* und *Emotionsprofil*) vor, mit denen wir c) das Korpus bezüglich mutmaßlicher märchentypischer Grausamkeit oder Optimismus analysieren. Die Märchen enthalten im Schnitt mehr als 50 % emotionale Sätze ohne eindeutig negative Tendenz sowie diverse Muster im Emotionsverlauf. Zusammen unterstreichen diese Befunde die Rolle von Emotionen als handlungstreibende Elemente im Märchen als stark schematisiertem historischem Genre.

1. Introduction

In this contribution to *Computational Literary Studies* (CLS), we take a quantitative approach to investigate textually encoded emotions in the *Animal and Magic Tales* (German: *Tier- und Zaubermärchen*, short: *AMT*), a subset of the Brothers Grimm's *Children's and Household Tales* (German: *Kinder- und Hausmärchen*, short: *CHT*). These ›traditional‹ fairy tales that were published as folk tales have been criticized for the cruelty that is applied by and to their characters,[1] and, by extension, for the *negativity* of their content. Yet, at the same time, as suggested for example by Herrmann Bausinger, fairy tales count as an *optimistic* genre, typically coined by happy endings and essentially fortunate characters.[2]

This paradox is not easily resolved. First of all, it needs to be taken into account that the Grimms' fairy tales are handled as literary ›folk tales.‹ To a certain extent, the *CHT* can indeed be seen in continuation of antique and pre-modern narratives, but they were also re-written for a *bourgeois* readership of the 19th and early 20th Century. Since the tales were immensely popular among these readers, they apparently satisfied a set of specific needs, one of which is an entertainment function that draws on the repertoire of traditional folk narratives: the stories can be blatantly cruel, but are located in an idealized past; also, they are schematically optimistic. These features can relieve readers of different aspects of the demands of modernity.[3] Secondly, Bausinger argues that »fairy-tale happiness does not describe a constant state of bliss, but is an effect that results especially from the downs« in the stories' ups and downs: it is drawn from the *overcoming* of the hardships, dangers and defeats.[4] Along those lines, broad research from anthropology, educational sciences, psychology, and literary studies has posited that the creative grounds for legends and fairy tales relate to motives of fear and need for help, to wishes and hopes, in short: to emotionally charged, and potentially negative, situations.[5]

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[1] Cf. Röhrich 2016; Schenda 1977, p. 359.

[2] Cf. Bausinger 1983.

[3] Cf. Neuhaus's discussion of Schenda's socio-historical approach: Neuhaus 2017, p. 30.

[4] »[F]airy-tale happiness is a contrastive phenomenon. It comes about because in this happiness we sympathize with the hardships overcome, the dangers and defeats that constitute the actual fairy tale plot.« (Bausinger 1983, p. 19). (translation ours: »[D]as Märchenglück ist ein Kontrastphänomen. Es kommt zustande, weil wir in diesem Glück die überwundenen Entbehrungen, die Gefahren und Niederlagen mitempfinden, welche die eigentliche Märchenhandlung ausmachen«).

[5] Cf. Horn 2016a.

For our means, it is of high interest that emotions and feelings are a key ingredient of those stories. If emotions are seen as drivers of the narrative plot,[6] they should be observable at the textual level as an *emotion potential*, and not just arise in the reader in response to the text.[7] So far, only few studies have systematically studied the range and diversity of ›textual‹ emotions, and to our knowledge, still fewer in a clearly delineated corpus of the *CHT*.[8] It is thus an open question how emotions are distributed in this core corpus — are there overall more negative emotions, or more positive ones? And how do these emotions transition within the plots? What specific discrete emotions are particularly frequent in the fairy tales, and is there much variability across the corpus? Approaching the matter at the interface of cognitive psychology and computational literary studies, we thus ask how a core corpus (*ChildTale-A*) selected from the Grimms' *CHT* textually encodes emotions.

To ask systematic questions about textually encoded emotion, Digital Humanities (DH) scholars can access various resources from *computational emotion classification* and *sentiment analysis* (SA). However, research on emotions in historical and literary texts has to face problems such as semantic context sensitivity and domain adaptation when working with texts of a specific genre, a particular time period, and languages other than English.[9] In the present study, we chose not to use ›out-of-the-box‹ sentiment analysis, as for example the *syuzhet* Package[10] or existing sentiment dictionaries.[11] Instead, to pave the way for a domain-adapted study of the Grimms' fairy tales and similar texts in German, we apply manual annotation at the sentence level to determine the texts' emotion potentials in a selected sub-corpus (*N* = 80) of the Grimms' *CHT*. Our annotation procedure implements the specific narrative schema of the fairy-tale genre and two main theoretical approaches from emotion psychology.

In doing so, we aim to contribute to CLS in three ways: Firstly, by introducing a *gold standard* of textually encoded emotion (the *ChildTale-A* corpus*, see below, Section 3), which in the future may be used to improve supervised machine learning based sentiment and emotion analysis. Secondly, by using the data set for answering research questions about the emotional setup of the fairy tales. Thirdly, as a contribution to CLS methodology, we introduce four measures: *Average Valence*, *Emotion Potential*, *Emotional Arc*, and *Emotion Profile* which may be useful tools for the in-depth qualitative and quantitative analysis of textual encoded emotion potentials and its visualization.

2. Emotions in Fairy Tales

2.1 Fairy Tales

The Grimm's *Children's and Household Tales* feature — next to the Luther Bible — among the most widely known books of German cultural history. As literary folk tales, they were registered by the UNESCO's Memory of the World Registry in 2005, representing »poetry of the human imagination in a universally valid form.« The Grimms' *CHT* are canonical children's literature and are regarded, among other things, as an anthropologically relevant genre of evolutionary adaptation via enculturation and socialization, assumed to help fostering children's emotional development and emotion regulation.[12] From the vantage point of interdisciplinary affect studies, the *CHT* are interesting because they both ›represent‹ aesthetic-historical emotions and are likely to shape the understanding of emotions in (young) readers,[13] a point that, in view of constantly changing reading habits, needs to be regularly re-examined.

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[6] Cf. Geck 2014.

[7] Adopting a cultural-semiotic perspective, we consider textually encoded emotions as emotion potentials that are textual ›surface phenomena‹ (cf. Hillebrandt 2011, p. 78), and as such amenable to quantitative analysis. There are examples of such an approach, especially in psycholinguistic research, based on the idea that words associated with emotions reflect the actual emotional content (cf. Bestgen 1994, p. 32).

[8] For first studies using sentiment analysis tools, cf. Mohammad 2011 and Rotari 2018.

[9] For the most recent comprehensive overview on and critical evaluation of sentiment analysis applied to German literary texts, cf. Kim / Klinger 2019; for a recent application of modern sentiment analysis using transformer models to drama as one domain of German literary texts, cf. Schmidt et al. 2021. Fehle and colleagues run a comparison of 19 German sentiment lexicons and 20 sentiment-annotated corpora and conclude that »compared to English lexicon-based resources which can achieve f1 measures above 70 % [...] the German resources perform rather poorly.« (Fehle et al. 2021, p. 9).

[10] Jockers 2020b. For a review of sentiment analysis applied to story shape research, applications and critical discussion, cf. Elkins 2022.

[11] For a comparison of sentiment dictionaries applied to diverse domains of German texts, cf. Fehle et al. 2021; for a comparison of widely-used sentiment dictionaries applied to a corpus of German literary texts, cf. Grisot / Herrmann, submitted.

[12] Interdisciplinary research between pedagogy, literary studies and psychology suggests that literary reading is a central vehicle for acquiring emotional competence, cf. Petermann / Wiedebusch 2016. This idea has been specifically formulated for fairy tales, c.f. for example Lüthi 2004, pp. 105–114; Zipes 2006.

[13] As D'Arcens formulates for historical studies of emotions in literature: »A key challenge [...] lies in developing an approach that identifies how these aesthetic-emotional features are also shaped by, and in turn shape, the emotional discourses and practices particular to their own place and time, yet with an awareness of how they continue to participate in a longer and larger history of human emotion.« (D'Arcens 2020, p. 124).

Fairy tales as folk tales[14] are among the ›simple forms‹ cataloged by André Jolles,[15] i. e. narrative genres that are morphologically and typologically described as non-complex and that may correspond to anthropologically basic schemas that have evolved over a long history in many cultures. Along these lines, fairy tales have a reduced, simple style, as »worldly [welthaltige] adventure narrative[s] of rasping, sublimating stylistic form.«[16] Formally, they are thus coined by repetition, semantic contrast, and formulaicity. In terms of narrative structure, they are plot-driven and realistically narrated (Max Lüthi's ›welthaltig‹), despite the abundant fantastic elements. In terms of motives and content, fairy tales are defined as stories of ›lack and remedy,‹ ›problems and solutions,‹ ›seeking and finding,‹ that are outlined schematically and narrated ›flatly,‹ that is, with a single-strand, stereotyped plot, stereotyped settings, one-dimensional, i. e. not psychologized, characters, and simple world views.[17] They typically end well.[18]

With regard to their generic features, it is important to note that the purported ›orality‹ and the ›unadulterated‹ presentation of the tales in the *CHT* collection has long been demystified: The tales were co-composed by the collectors on the basis of different types of oral and even written sources,[19] which lead to the Grimms' signature style and structure, which is most prototypical in the *Animal and Magic Tales*. This set of tales, which deviates from similar genres, such as ›Schwank,‹ legend and fable, but also from the more clearly authored ›art fairy tale,‹ can be retrieved in the catalog of motives first introduced by the Finnish school of systematic-empirical folk tale research.[20] In the following, we will be focusing on this core set of around 110 tales.

In the plots of the *Animal and Magic Tales*, textually encoded emotions are particularly clearly identifiable drivers of action.[21] The typified characters are distinctly discernible as good and evil, and thus feelings and emotions are distributed according to roles,[22] with a lack of psychologization, while, often, a moral perspective is observable.[23] Elements of magic (›the marvelous‹), especially in the form of ›supernatural helpers,‹ can be animals, plants, anthropomorphic, as well as magic gifts.[24] These magic components are presented as ›matter of fact‹ within the fictional world; they are key elements of plot development as they typically induce change. Although the fairy tales open up a wide array of potential interpretations, their shortness, stylistic markedness, symbolic underdetermination, dimension of marvelousness, and schematic narration constitute a clearly recognizable and basic structure.

2.2 Theoretical Perspectives in Emotion Research

Emotions have long been a core topic across different disciplines. Within psychological theories, the standard view conceptualizes an emotion observed in humans as a response to a stimulus or a situation initiated by different appraisals that indicate personal significance. Human emotions involve subjective experience, physiology, thoughts, and behavior.[25] The basic emotion perspective suggests that emotion episodes can be sorted into discrete emotion types, i. e., different basic forms that are biological adaptations, characterized by facial and bodily expressions and physiological reactions.[26] Emotional experiences can therefore be categorized using labels like *anger*, *disgust*, *fear*, *sadness*, *surprise*, and *happiness*, whereby there is no agreement about the exact number of categories. Although this approach is close to our everyday experience and underpinned by empirical results from psychological,[27] ethnographic[28] and even neuroscientific research,[29] there are several shortcomings.[30] For example, even if

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[14] With their schematic structure, the fairy tales of the Grimms' CHT collection are so-called ›folk tales,‹ defined by an idealized orality. As a genre, these are distinguished from ›art fairy tales,‹ which are more complex, clearly attributable to particular authors and a straightforwardly written genre. Cf. for example Neuhaus 2017.
[15] Jolles 1930.
[16] Lüthi 2005, p. 77 (translation ours).
[17] Cf. Lüthi 2016; Neuhaus 2017. It needs to be noted that the 7th edition of the Grimms' fairy tales is not as reduced in style as the prior versions, using for example more generic ›folk tale formulas‹ such as ›once upon a time‹ and more detailed descriptions in the typical style of Wilhelm Grimm.
[18] The ›happy ending‹ is one of the prototypical features of folk tales. However, this is not uncontested. Even among the Brothers Grimm's CHTs, there are several tales with no clear happy ending, cf. for example Uther, who lists seventeen CHTs with a ›bad ending‹: Uther 2013, p. 612: »schlechter Schluß (schlechter Ausgang der Erzählung) 26, 30, 35, 39, 41, 44, 80, 90, 92, 95, 117, 145, 150, 171, 185; 8 (1812), 175 (1840-50)« (cf. Röhrich 1958).
[19] Cf. Bluhm 2022; Rölleke 2004; Uther 2013. The CHT were published in seven editions between 1813 and 1857 with subsequent alterations in content, style, and the number of tales included, cf. for example Uther 2013. They were increasingly de-sexualized, while introducing more humorous traits, christianizing the content and stylizing in the sense of a ›housefather literature.‹
[20] This school takes up the unfinished original research program of the Brothers Grimm, starting with the publication of Antti Aarne's The Types of the Folktales in 1910, which was subsequently broadened by Stith Thompson in 1927 and 1961, as well as edited and supplemented by Hans-Jörg Uther in 2004 (Aarne 1961; Uther 2004).
[21] See Geck 2014. An assessment of Uther's (2013) handbook index rendered more than ninety affective and emotional terms (for example, contentment, rage, anger, just to name the ones towards the end of the German alphabet).
[22] Cf. Horn 2016a.
[23] Cf. Rölleke 2004.
[24] Cf. Horn 2016b.
[25] Cf. van Berkum 2022, p. 6.
[26] Cf. Ekman 1992.
[27] Cf. for example Lench, et al. 2011.
[28] Cf. for example Ekman 1992.
[29] Cf. for example Pankseep / Watt 2011.
[30] Cf. van Berkum 2022, pp. 9–11.

basic emotions are understood as categories that create a semantic space used to characterize our emotional experiences as well as linguistic descriptions of it, these categories are not clearly demarcated. Alan Cowen and colleagues therefore suggest that emotional experiences are best described by gradients rather than discrete categories.[31]

According to another major theoretical perspective in emotion psychology, the *dimensional approach*, the variety in our emotional experience may be studied along major dimensions. The two most often discussed and explored ones are *valence* and *arousal*, the first reaching from positive to negative, the second represents activation and intensity.[32] Following the circumplex model by James A. Russell,[33] each specific emotion reflects a particular constellation of a core affect and can be described by a specific location on the dimensions valence and arousal.[34] Also words and pictures depicting emotional content can be characterized with these two dimensions.[35] Sentiment analysis systems developed to automatically recognize and categorize emotional content in literary texts[36] implement both the *basic emotion approach* and the *dimensional approach*.[37]

Also approaches focusing on the development of emotions, including functionalist views such as the *hierarchical model*,[38] integrate aspects of the two general perspectives described above. For example, the hierarchical model of Fischer and colleagues combines a superordinate level resembling the valence dimension (but with a categorical division into positive versus negative), a level of basic emotion categories, and in addition a level of subordinate categories that are more complex and whose development depends on specific experience in social contexts. A recent study by Gerlind Grosse and colleagues[39] on the development of the emotional vocabulary reveals that German children first use general ›emotion‹ terms like ›good‹ or ›bad.‹ Only later on they acquire labels of basic and even later of complex emotions.

2.3 Emotions in Fictional Narratives and Fairy Tales

Despite the central role that emotions play in the content, structure, and for the effects of literary texts, the study of emotions has long been neglected in literary studies; it picked up only during the affective turn of the 1990s.[40] Studies of emotion in literature can normally be distinguished by a predominant focus either on (a) readers, putting a particular emphasis on the emotions potentially evoked in the audience,[41] the (b) cultural-historical context, tracing the different incarnations of specific emotions such as *jealousy* or *joy* through genres and literary periods,[42] or on (c) emotions as *textual* phenomena, based on an understanding of the symbolic, textually encoded, and cultural character of emotions.[43]

Literary studies of emotion have typically focused on ›discrete‹ emotions, such as *anger*, *hatred*, *jealousy*, *envy*, *love*, *longing*, or *desire*. This trend appears in direct contrast with psychology and even psycholinguistics, where empirical research is just as often based on the dimensional approaches mentioned above.[44] Literary studies of emotions apply contextual, hermeneutic or semiotic methods, and their analyses deal with specific texts, authors, or – less often – genres[45] or literary periods, such as romanticism.[46]

In text-oriented studies of emotion, such as the present one, emotional content is viewed as encoded by *morphemes*, *lexemes*, *sentences*, or *stylistic units*, such as *metaphors* and *allegories*. Such studies, as proposed most prominently by Simone Winko,[47] identify an emotion potential of texts that is constituted by the »totality of all emotive and evaluative text elements of a formal

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[31] Cf. Cowen et al. 2019, p. 84.
[32] Cf. van Berkum 2022, p. 14.
[33] Cf. Russell 1980.
[34] Cf. Posner et al. 2005.
[35] Cf. Bradley / Lang 1999; Lang et al. 2008.
[36] Cf. for example Mohammad 2011; Jacobs / Kinder 2020.
[37] Cf. also Kim / Klinger 2019.
[38] Cf. Fischer et al. 1990.
[39] Grosse et al. 2021.
[40] For recent overviews, cf. the edited volumes by Hogan et al. 2022 and Koppenfels / Zumbusch 2016. Cf. also Flüh 2020.
[41] Cf. Alfes 1995; Anz 2007; Mellmann 2006; Voss 2004; Winko 2022.
[42] Such approaches study emotions and language in connection with poetics, social conditions, historical conjunctures and change, including the institutions involved in the political sector, media, the labor market, military, education, religion or family. For joy, for example, Anja Gerigk states that in the German literary discourse around 1800, joy becomes a ›universal idea.‹ She mentions as exemplary texts Klopstock's odes, some of Hölderlin's poems, and most prominently Schiller's hymn of 1785 to the ›beautiful spark of the gods,‹ while in later literary periods, joyfulness »becomes a precarious exception« (p. 546). As these observations refer to highly canonical texts, they should eventually be tested on broader literary corpora (cf. Gerigk 2016).
[43] The different types of text-oriented studies convene in stressing that feelings and emotions in texts are represented, or encoded, and thus not the ›emotions themselves,‹ which emerge in the involved actors (cf. Winko 2003; cf. also Hillebrandt 2011 and (text) linguistic approaches that capture the emotional dimension of texts such as Schwarz-Friesel 2017; cf. also Benthien et al. 2000, p. 7).
[44] Cf. Lindquist 2021.
[45] Cf. Meyer-Sickendiek 2005.
[46] Cf. Schwarz-Friesel 2017; Hogan et al. 2022; Koppenfels / Zumbusch 2016.
[47] Winko 2003.

and substantive nature.«[48] This vantage point is shared in psychological and psycholinguistic research, based on the idea that the affective content of text may be approached or estimated by using the affective meaning of the words composing the text.[49] The emotion potential can be determined using text-analytical and linguistic methods, and may even be »independent from epochs, genres, and production factors.«[50] We are skeptical about the latter, since historical and cultural differences, including historical language change, impose limitations on the ability to identify ›the emotions‹ in a piece of literature.[51] Yet, we fundamentally assume that a precise textual analysis can record and describe the emotive and evaluative aspects of a respective text structure and content, and that accordingly, emotion potentials may be identified for texts.[52]

Our semiotically oriented perspective[53] approaches literary text without direct statements about reception through readers, and it grasps emotions as a culturally situated code of their own.[54] Thus, by contrast to reader-oriented studies, we are focusing on what the text holds. With the import of *text-mining* practices to the humanities, a large array of computational emotion classification and sentiment analysis resources[55] has become available. Also in German-language computational literary studies, approaches increasingly apply the above-mentioned psychological dimensions of valence and arousal and the *discrete basic emotions* to model emotions in literary texts.[56] In DH and *Natural Language Processing* (NLP), fairy tales have been a popular topic,[57] which can be explained by their comparatively simple structure that poses less problems to automatic analysis than other genres, as well as the ongoing discussions about their dark and negative content.[58]

One of the robust discoveries of sentiment analysis is that textually encoded emotions can work as a proxy for plot structure, where sentiment trajectories describe emotional states over the course of a narration,[59] or can identify the presence or absence of a happy ending.[60] Andrew J. Reagan and colleagues[61] proposed six basic shapes of emotional trajectories, while Evgeny Kim and colleagues[62] analyzed the emotion trajectories in various genres for different discrete emotions.

However, despite dynamic research, the widely applied SA methods are still quite crude, often using word-level sentiment and fixed dictionaries that cannot account for negation, intensification or, for example, figurative language.[63] For the automatic analysis of discrete emotions in German, only few resources are available so far, some of which are still in the prototype stage, and their problems are evident in the assignment of emotion categories (low inter-annotator reliability for core lexica, lack of unique values, emotion lexica translated from English).[64] As dictionary-based resources, these still show the above-mentioned weaknesses combined with low semantic context sensitivity and lexical coverage.

From a semiotic perspective, any individual literary text constitutes its particular *secondary semiotic system*, which makes it highly likely that it encodes emotions in a way that can be resolved eventually only through knowledge of the specific text – and thus not solely by resource to the general language / culture system (the *primary semiotic system*).[65] This has implications for the automatic or semi-automatic matching of emotion constructs onto linguistic codes, which are typically underspecified, if coming from language-general resources, or overspecified, if coming from specialized resources. In other words, dictionary-based SA is typically based on over- or underspecified models of primary semiotic systems — while what is needed are methods that can model emotions from the secondary semiotic systems.

In the present study, we move towards this goal by starting with annotating the *CHT* corpus sentence-by-sentence. As a schematic genre, the *CHT* share emotional codes across the individual texts, something that increases the chances of automatic emotion and sentiment detection, and is implemented in our annotation procedure that considers *genre schema* as well as the *story meaning* of the individual texts. By using sentences as basic units, it goes beyond the single-words approach of

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[48] Schwarz-Friesel 2017, p. 355, translation ours.
[49] Cf. Bestgen 1994; Lüdtke / Jacobs 2015.
[50] Schwarz-Friesel 2017, p. 355, translation ours.
[51] Cf. Lynch 2022, p. 101; D'Arcens 2020.
[52] Cf. Schwarz-Friesel 2017, p. 355.
[53] Cf. Lotman 1993, who emphasizes the role of the poetic function of language. Cf. also Nantke 2017, p. 3, for ensuing thoughts about a digital semiotics of literary texts.
[54] Cf. Winko 2003, p. 109; Vester 1991.
[55] Cf. Pang / Lee 2008.
[56] Cf. Kim / Klinger 2019; Zehe et al. 2017. For a different approach that historically models a set of discrete emotions for drama, cf. Dennerlein et al., accepted.
[57] Cf. Alm / Sproat 2005; Finlayson 2012; Geck 2014; Mohammad 2011.
[58] Cf. Rotari 2018.
[59] Elsner 2015; Jockers 2014; Zehe et al. 2017; Mohammad 2011.
[60] Zehe et al. 2016.
[61] Reagan et al. 2016.
[62] Kim et al. 2017.
[63] Cf. Fehle et al. 2021; Kim / Klinger 2019.
[64] Cf. Klinger et al. 2016; Stamm 2014.
[65] Cf. Lotman 1981.

traditional sentiment dictionaries.[66] Furthermore, with Gerald Prince, we use sentences as (rough) proxies for narrative events.[67] Operationalizing two psychological constructs of emotion, evaluating intercoder reliability, and sharing all research data, our annotation strives to be maximally transparent and to reach a comparatively high degree of validity.

2.4 Operationalisation of Emotions in Fairy Tales

As folk tales, Grimm's fairy tales do not address the characters' psychological motivations in a detailed way. Rather, even the main characters' emotional states and traits are normally rendered in a formulaic and implicit manner.[68] Yet, as mentioned above, it has been shown that that fairy tales »appeal to audiences through their emotions,«[69] and that emotions and their symptoms are vital drivers of the narrative. Fear or anger experienced by the main character, for example, are likely to lead to actions, such as the appearance of a supernatural helper / gift, or the initialization of a quest.[70]

- In the tales' narratives, emotions are often textually encoded through simple assertions as for example in: »Then the girl brought the bowl to her stepmother, was happy and thought she could go to the wedding with her.«[71]
- More often, however, they are ›implicitly‹ encoded, that is, not explicitly referenced through lexis, but through the description of bodily actions, including speech, facial expressions, gesture, and other involuntary bodily assertions. The narration of a character's linguistic or other behavior allows the conclusion that a certain emotion is present without being explicitly named linguistically, relying on a formulaic match between some emotional content and its accompanying symptoms, such as laughter, kissing, beard-pulling, blushing, fainting[72] — and tears: »Cinderella obeyed, but cried because she would have liked to go to the dance too.«[73]
- Among these implicitly encoded emotions also belong more extended physical situations that result from emotions and that produce emotions, for example in: »But the dwarf cursed him, and he, like the other, got into a mountain ravine and could not go forward or backward,«[74] where the characters are likely to experience anger and fear.[75]

3. Data Collection and Method

3.1 Data Collection

To create the *ChildTale-A* corpus, we started with compiling the titles of the $N = 198$ *Children's and Household Tales* of the 7th edition (1857) by the Brothers Grimm in a spreadsheet. This spreadsheet holds the texts' titles, as well as codes for *CHT* and *the Aarne-Thompson-Uther-Inddex (ATU)* (including those for the subset of *Animal and Magic Tales*) according to Hans-Jörg Uther's work (based on the *Große Auflage*).[76] Two independent experts categorized the preselected tales as either *Animal and Magic Tales* or ›other‹ excluding such tales that are written in dialect or that have a genre different from our core selection (for example, ›Schwank,‹ legends). This rendered a list of $N = 104$ tales.

Around ten of these were used for training of annotators. Since texts needed to be assigned to the annotators in a balanced number, we finally selected $N = 80$ tales for annotation and analysis (see Table S1). We compiled all electronic texts from Wikisource as .txt files, preprocessing the texts by excluding extra white space, comments, and page numbers, fixing special character encoding, and normalizing orthography (the latter for enabling additional automatic sentiment analysis). For the annotation, each plain text was transformed into a single .xlsx table, sentences represented by one line each, with fields for annotation in columns (we created two sets of tables, one for discrete emotions, one for dimensional emotions, see 3.2 and 3.3). Remaining parsing errors were manually corrected.

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[66] Word-embedding based dictionaries are another approach to solve the contextualization problem, cf. for example Jacobs / Kinder 2020.

[67] Prince defines an event in a story as »any part of that story which can be expressed by a sentence, where sentence is taken to be the transform of at least one, but less than two, discrete elementary string«; (Prince 1973, p. 17).

[68] Lüthi 2016.

[69] Jones 2002, p. xiv.

[70] Horn 2016a.

[71] Cinderella (CHT 21), Sentence 34, emphasis / translation ours.

[72] Cf. Horn 2016a.

[73] Cinderella, Sentence 27, emphasis / translation ours.

[74] The Water of Life (CHT 97), Sentence 17, emphasis / translation ours.

[75] In our study, we observe emotions at the primary level of the narrative, at face value of the stories and their characters. Of course, a secondary level of the narrative may be addressed where the story is allegorically read. Here, a situation of ›neither forward nor backward‹ may be matched into any situation in which one is trapped after having taken a wrong decision (and being punished for it).

[76] Uther 2004.

3.2 Annotation of Emotional Content Expressed in Sentences

Since different perspectives – such as that of the reader or that of the text itself – can influence the type and quality of the annotation,[77] annotators were instructed to differentiate between a possible reader's response and the textual (semiotic) level. They were asked to annotate emotions encoded in the text. Sentences were defined as basic annotation units and treated as rough proxy for narrative events in the sense of Prince.[78] For a high level of systematicity and precision of annotation, annotators received instructions about *genre schema* (for example, lack of psychologization, steady perspectivation of heroes, no ›deep interpretation‹) and were prompted to form a *story meaning* by reading the individual text before annotation.[79]

Following the hierarchical approach of Kurt W. Fischer and colleagues,[80] we used two different annotation schemas (see Table 1) and organized the annotation process in two different runs.

The first schema (›dimensional‹) implements the dimensional approach according to which emotions and the emotional content of language and objects are described on the two dimensions valence and arousal.[81] Following the standard research on single word processing,[82] the valence of a sentence was annotated on a seven-point bipolar scale ranging from -3 (labeled as negative) to +3 (labeled as positive), with ›neutral‹ (0) in the center. Arousal was annotated on a 5-point scale labeled with the anchors ›ruhig, entspannt‹ (›calm / relaxed‹) for 1 and ›erregt / aufgeregt‹ (›excited / agitated‹) for 5. Moreover, while annotating the degree of valence and arousal, the annotators also indicated for each sentence to which character and by which narrative instance an emotion is attributed (for example the character itself or another character; see Table 1 for details).

The second schema (›discrete‹) implements basic emotion theory.[83] Since there is noresearch consensus about the exact number and nature of the basic emotions,[84] we followed Grosse and colleagues.[85] and used the basic emotions anger, disgust, fear, joy, sadness, and surprise. Instead of annotating the degree or intensity of each basic emotion within each sentence, the annotators were instructed to indicate whether one or more of the basic emotions was textually encoded or not. For each sentence, none, one, or any number of the six basic emotions could be annotated. Moreover, if the presence of an emotion was annotated, the annotators also indicated whether the emotion(s) were expressed explicitly, i. e. using emotion words (for example nouns like ›fear,‹ adjectives like ›sadly‹ or verbs like ›to grieve‹) or implicitly, for example a bodily action, metaphor, or paraphrase. If a detected emotional content could not be identified as belonging to one of the six basic emotions, the annotators could add a note describing the identified emotion using their own words.

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[77] Cf. Buechel / Hahn 2017.
[78] Cf. Prince 1973, p. 17.
[79] A full definition of what is to be understood as ›text meaning‹ is a desideratum of interdisciplinary theorizing including perspectives from reception studies, literary semiotics, hermeneutics, and psycholinguistics. After attempts by Iser, Eco and others, so far no updated model of meaning representation at the textual level of discourse has been proposed. When we annotate emotions, we are not operating at the level of the situation model that was first proposed by van Dijk and Kintsch 1983, because our model is not a cognitive model. Rather, we address what has been called the text strategy, assessing the encoded signs and inferences (cf. for example Jannidis 2004, p. 28). However, the question of the location of different kinds of inferences, especially when adding genre knowledge, as proposed by Hanauer 1998, is still a topic of unresolved debate even for cognitive models. For our textual modeling of meaning, it is thus an open question how a coherent representation of the narration is built from the text surface, from a network of propositions and from ›probable,‹ ›intersubjective‹ inferences. Future theoretical modeling will want to utilize machine learning with Language Models (LMs) as well as manual annotations.
[80] Cf. Fischer et al. 1990.
[81] Cf. Russell 1980.
[82] Cf. Bradley / Lang 1999; Võ et al. 2009; Schmidtke et al. 2014.
[83] Cf. Ekman 1992; Levenson 2011.
[84] Cf. Tracy / Randels 2011, p. 399.
[85] Grosse et al. 2021.

	dimension	coding	specific instruction	anchors / examples
Schema 1: ›dimensional‹	valence	continuous scale from -3 to 3	Please indicate to what extent the sentence describes something as negative, neutral or positive.	negative (-3) over neutral (0) to positive (3)
	arousal	continuous scale from 1 to 5	Please indicate to what extent the sentence describes something as calm / relaxed or something excited / agitated.	calm/relaxed (1) to excited/agitated (5)
	whom?	free answer format	To ›whom‹ (which character) is the emotion(s) attributed?	for example to Cinderella, to the bear
	who?	free answer format	›Who‹ attributes this emotion(s)?	for example by the character itself, by another character
	notes	free answer format		
Schema 2: ›discrete‹	fear	presence (categorial): yes or no	›Annotate the emotional content by evaluating which emotions are expressed. You can choose between six different emotions. Here, it is possible that no emotion is present, only one, or several at once.‹	for example, fear like when seeing angry fighting dog w/o a leash
	anger			for example, anger as when s.o. snatches parking space/last cup of coffee from you
	sadness			for example, sadness at death of a beloved pet
	disgust			for example, disgust at the sight of swarming maggots
	joy			for example, joy at a successful birthday party
	surprise			for example, surprise at very unexpected meeting of a person
	explicit / implicit	if presence kind of expression (categorial): explicit or implicit	›Please indicate whether the sentence directly names emotion(s) or emotional action(s) explicitly using emotion words or whether the text merely suggests or paraphrases that an emotion is present. Implicit emotionality can include quite explicit descriptions, but they are still implicit if no emotion is named directly.‹	explicit: for example, he was full of anger, they rejoiced implicit: for example, she wept bitterly
	notes	free answer format		

Note: As the main focus in this paper is on textually encoded emotions, we here do not further analyze the annotations for the categories whom?, who?, and explicit / implicit. The fairy tales as well as the original instructions are available in our Zenodo repository (Lüdtke / Herrmann 2023).

Tab. 1: Annotation schemas and specific instructions for each category.

3.3 Workflow, Data Preparation, and Reliability of the Annotations

3.3.1 Workflow

The annotation process was embedded in an interdisciplinary M. A. seminar (›Emotionsanalyse in der Digitalen Literaturwissenschaft‹) that took place at Freie Universität Berlin in the fall term 2020 / 2021. During the seminar, students were first introduced to folk tales research, specifically, the *CHT*,[86] and also learned psychological approaches to the concept of emotions, in particular classical emotion theories (see 2.2). In total, 17 master students participated in the seminar and together with three student assistants, all of them acted as annotators. Annotation was prepared by a training phase, in which all annotators tested the two schemas, annotating respectively one of two fairy tales, followed by a group discussion of disagreements and open questions.

In both annotation runs, each annotator was given eight fairy tales. Each person first annotated all eight tales by schema one, and then the same eight fairy tales by schema two (Table 1). In total, each fairy tale was annotated by two different randomly selected annotators.

Within the two runs, annotation of each fairy tale was conducted in two steps: First and before annotating each single sentence of a fairy tale, an annotator read the tale as a whole, using the .txt file provided. Afterwards, the tale was read again sentence by sentence and annotations were recorded using the excel sheets provided (see 3.1). To prepare the annotated data for further analysis, we collapsed all single excel files from the first and the second annotation into one data table each.

3.3.2 Data Preparation and Reliability

The preprocessing was carried out separately for the two annotation runs. We first checked for missing values in annotations of valence and arousal: In total, out of N = 5579, n = 97 sentences showed only annotations from only one person. For one additional sentence both valence annotations were missing. In a next step we calculated Krippendorff's alpha to check for inter-rater reliability for valence and arousal using the *irr package*[87] in R[88] (see Table 2 for details). While the overall agreement for valence ($mean_{\alpha\text{-Valence}}$ = .64) indicates substantial agreement, the considerably lower overall mean for the arousal ($mean_{\alpha\text{-Arousal}}$ = .31) indicates only fair agreement.[89] In general, higher agreements for valence compared to arousal are in line with experiences from other rating studies.[90] The agreement differences between valence and arousal fit the results of Grosse and colleagues,[91] who clearly identified the *valence dimension* in verbal emotion descriptions, but failed to identify the *arousal dimension*. We therefore decided to concentrate on the analysis of the valence annotation. All further analyses are based on the valence value for each sentence, calculated as the mean over both annotations. If one annotation was missing, the other annotation was used (for the one sentence with no annotation an interpolation was used).

For the second annotation, a check for missing values was not possible, because annotators only coded the appearance of a basic emotion with »1,« but not the non-appearance. Missing values were automatically re-coded with »0« indicating non-appearance. Again Krippendorff's alpha was calculated to check the inter-rater reliability for each basic emotion and each fairy tale separately (see Table 2). Taken together, the reliability measures for the basic emotions were lower compared to the reliability observed for valence: between ›moderate‹ ($mean_{\alpha\text{-anger}}$ = .47, $mean_{\alpha\text{-sadness}}$ = .48, $mean_{\alpha\text{-joy}}$ = .43) and ›fair‹ ($mean_{\alpha\text{-fear}}$ = .39, $mean_{\alpha\text{-surprise}}$ = .28, $mean_{\alpha\text{-disgust}}$ = .17). Again, the relatively low values are in line with the literature on reliability measures for individual emotions.

Cecilia Ovesdotter Alm and Richard Sproat,[92] for example, also reported ›moderate‹ and ›fair‹ Kappa values between .2 and .5 for their annotations of specific emotions. We agree with their assumption that one reason may be the difficulty of clearly distinguishing discrete emotions from one another. Moreover, our data show that the rarity of individual emotions, especially in the case of disgust, is problematic, as shown for example by the annotations for the fairy tale *Thumbling's Travels* (ID10/CHT45):[93]

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[86] Neuhaus 2017.
[87] Gamer et al. 2019.
[88] R Core Team 2021.
[89] Cf. Landis / Koch 1977, p. 165.
[90] Cf. Kaakinen et al. 2022, p. 9.; Warriner et al. 2013, p. 1194.
[91] Cf. Grosse et al. 2021, p. 157.
[92] Alm / Sproat 2005, p. 670.
[93] The original German titles and their English translations (based on D. L. Ashliman's translation) can be found in Table S1 in the Appendix. Moreover, each fairy tale in *ChildTale-A* is indicated by an ID.

Here, in *n* = 71 sentences, no presence of disgust was jointly annotated, and only in one sentence one of the annotators indicated disgust, resulting in a Krippendorff's alpha of α = 0. Further exploration of disgust showed that both annotators indicated that emotional content was represented implicitly. We assume that *implicitness* is a further reason for low reliability. To handle the shortcomings of Krippendorff's alpha, we calculated a second alternative measure for reliability, the simple percentages of agreement.[94] As depicted in Table 2, this measure reveals high values between 79 % (joy) and 98 % (disgust), which encouraged further analysis. All further analyses are based on the integration of two annotations available per fairy tale, using a liberal approach. The appearance of an emotion was finally coded with yes or 1 when at least identified by one of the annotators.[95]

		Krippendorff's alpha						percentage of agreement[4]	
		mean	*SD*	*min*	*max*	*N*[3]		*mean*	*SD*
first anno-tation[1]	*valence*	.64	.16	.22	.90	79		-	-
	arousal	.33	.21	0	.85	79		-	-
second an-notation[2]	*anger*	.47	.30	0	1	77		93.42	6.42
	disgust	.17	.30	0	1	38		98.33	2.72
	fear	.39	.26	0	1	77		89.11	7.47
	joy	.43	.22	0	1	80		79.31	13.11
	sadness	.47	.26	0	1	77		88.88	7.85
	surprise	.28	.24	0	1	80		84.53	8.05

Note: The calculation of the Krippedorff's alpha permits negative values. We calculated the arithmetic mean by setting all negative values to zero[96] to get reliability estimates that vary between 0 and 1.
[1]calculated with specification ›interval‹
[2]calculated with specification ›nominal‹
[3] Reliability could be calculated only if two annotations were available and/or the emotion at hand (in the case of basic emotions) was indicated at least in one sentence, which lowers the number of fairy tales for which reliability score could be computed. N reports the number of fairy tales for which we could calculate Krippendorff's alpha.
[4] Percentage of agreement could be calculated for the annotations for all *N* = 80 fairy tales, but only for basic emotions.

Tab. 2: Reliability of annotations for valence, arousal, and the six basic emotions calculated separately for each fairy tale as averages of Krippendorff's alpha and percentage of agreement.

4. Results and Discussion

4.1 Four Measures Representing Different Features of Textually Encoded Emotion

The collected annotations can be used to answer different questions about the characteristics and functions of textual encoded emotions in the specific genre of the *CHT* in particular, or in literary texts in general. Sentiment analyses like that of Saif Mohammad and Gabriela Rotari[97] asked whether fairy tales are darker and more negative than other literary genres or epochs. Approaches within literary studies assume that »communication in literary texts is as a rule an emotionally highly intensive affair,«[98] and is thus interested in the extent of a textual emotion potential and whether specific and distinct emotional trajectories may be identified. Moreover, the role of specific emotions for some genres, texts, and epochs are discussed. In order to analyze emotions in literary texts in a comparative way, we suggest four different and relatively simple measures that describe different aspects of textually encoded emotions. In the following, we briefly describe each measure, i. e. how it characterizes the *CHT* as a specific genre and how it can be used for further in depth quantitative and qualitative analysis regarding different questions with respect to the role of emotions especially in *CHT* or in literary texts in general.

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[94] See Hallgren 2012, for critical remarks on that measure.
[95] All data are available in our Zenodo repository (Lüdtke / Herrmann 2023).
[96] Cf. Wirtz / Caspar 2002.
[97] Mohammad 2011; Rotari 2018.
[98] Anz 2007, p. 207 (translation ours).

4.1.1 Average Valence

One often discussed question with respect to *CHT* is how gloomy or happy fairy tales are.

Testing the widespread idea that Grimms' fairy tales, even in the ›defused‹ edition from 1857, have a tendency to depict comparably dark and negative content, existing sentiment-analysis studies render conflicting results.[99] While Mohammad and Rotari applied dictionary-based sentiment analysis, we use more context-sensitive annotations: The valence annotations (scaled between -3 [›negative‹] and +3 [›positive‹]) for single sentences offer the possibility to characterize the overall emotional tone in each fairy tale as well as in the entire *ChildTale-A* corpus by calculating the arithmetic means for valence, the *Average Valence* over all sentences of a text.

The histogram in Figure 1[100] shows the relative frequency of the Average Valence (val_{av}) for $N = 80$ annotated fairy tales. We see that most of the fairy tales of our corpus are ›neutral,‹ which we determine as texts with values in between -0.5 and +0.5 (see below, 4.1.2). Also the overall mean for all Average Valence values is with *mean* = -0.008 (*SD*[101] = 0.37, *median* = -.05) neutral. The density curve indicated an approximately normal distribution. Only a few texts are slightly more negative overall, the ›most negative‹ fairy tales being *The Godfather* (val_{av} = -0.77) and *The Goose-Girl* (val_{av} = -0.76). However, outliers are observed only in the positive range (indicated by the dots in the boxplot in Figure 1), namely, the fairy tales *The Three Brothers*, val_{av} = 1.38) and *The Elves* (val_{av} = 0.83).
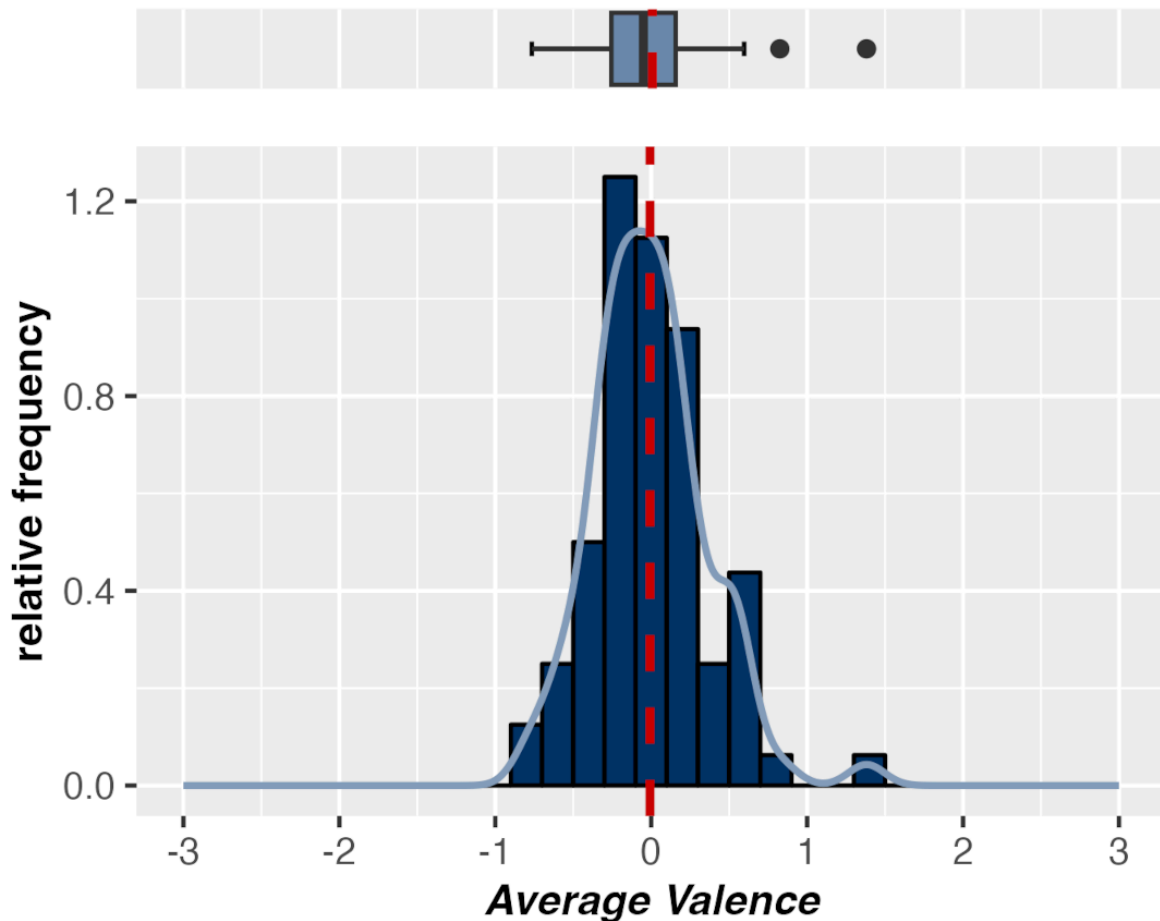
Fig. 1: Histogram, density curve and Boxplot for the Average Valence values of all annotated fairy tales. The y-axis shows the relative number of texts per valence segment, the dashed auxiliary line depicts the overall *mean* = -0.008. [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

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[99] Alm / Sproat 2005; Mohammad 2011; Rotari 2018.
[100] All figures in this article were created using R (R Core Team 2021) and the packages corrplot, cowplot, ggplot2, ggExtra, and ggpubr.
[101] *SD* = Standard Deviation.

In sum, the Average Valence values demonstrate that we do not observe a general tendency of the Animal and Magic Tales to be particularly dark. However, the overall neutral mean for all Average Valence values seems to indicate an absence of the often reported positivity bias in Western literature.[102] As the Average Valence is pitched at the highest level of generalization, a neutral value may however mean two things: either a general tendency towards the absence of emotions, or the presence of variation within each fairy tale. Since the arithmetic means gloss over the text-internal variance, our next analyses will take a closer look at those.

4.1.2 Emotion Potential

To disentangle the possible interpretation of Average Valence values around zero, we focussed on two questions:

- To what extent fairy tales are emotionally encoded?
- What proportion of each tale is in fact ›emotional‹ as opposed to ›neutral‹?

Here, what is under scrutiny is the tendency of fairy tales to encode emotion comparatively sparsely, including typified characters without psychologization,[103] as well as the presence of emotion variation within each fairy tale.

We classified all sentences according to their valence values as positive (valence ≥ 0.5), negative (valence ≤ -0.5), or neutral (-0.5 < valence < 0.5) and calculated the percentage of positive, negative, and neutral sentences within each fairy tale. As depicted in Figure 2A, there are significantly more neutral sentences ($mean_{neutral}$ = 41.69, $SD_{neutral}$ = 12.57) compared to positive ($mean_{positive}$ = 29.06, $SD_{positive}$ = 11.01) and negative sentences ($mean_{negative}$ = 29.25, $SD_{negative}$ = 11.58) within each fairy tale, while the average percentage of positive and negative sentences is equal.[104] The overall neutrality visible in the Average Valence values relies therefore on both a considerable amount of sentences characterized by an absence of textual encoded emotions and an equal occurrence of sentences with positive and negative emotions. To estimate the amount of emotionality, often discussed under the cultural-semiotic concept of textual *Emotion Potential* (EP),[105] we operationalized the Emotion Potential by calculating the proportion of sentences with textual encoded emotions, the sum of the percentage of positive and negative sentences. The histogram in Figure 2B depicts the distribution of the Emotion Potential values in our *ChildTale-A* corpus. More than 50 % of the annotated fairy tales have a proportion of at least 50 % emotion-bearing sentences (a 50 % cut-off is marked with the black dotted line), which is also visible in the overall mean for the Emotion Potential values ($mean_{EP}$ = 58.31, SD_{EP} = 12.57). This indicates a saturation with textual encoded emotion. Only in three fairy tales (including *The Strange Musician* and *The Devil with the Three Golden Hairs*) less than one third of the sentences are emotional (see Table S1 for more details).

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[102] Cf. Dodds et al. 2015; Green 2017; Jacobs et al. 2020.
[103] Cf. Lüthi 2016.
[104] The paired pairwise t-tests for neutral compared to negative and positive sentences are significant ($t(79) > 5.16$, $p < .0001$) but not the t-test comparing positive and negative sentences ($t < 1$). P-values for multiple pairwise paired t-tests are adjusted using the Bonferroni correction.
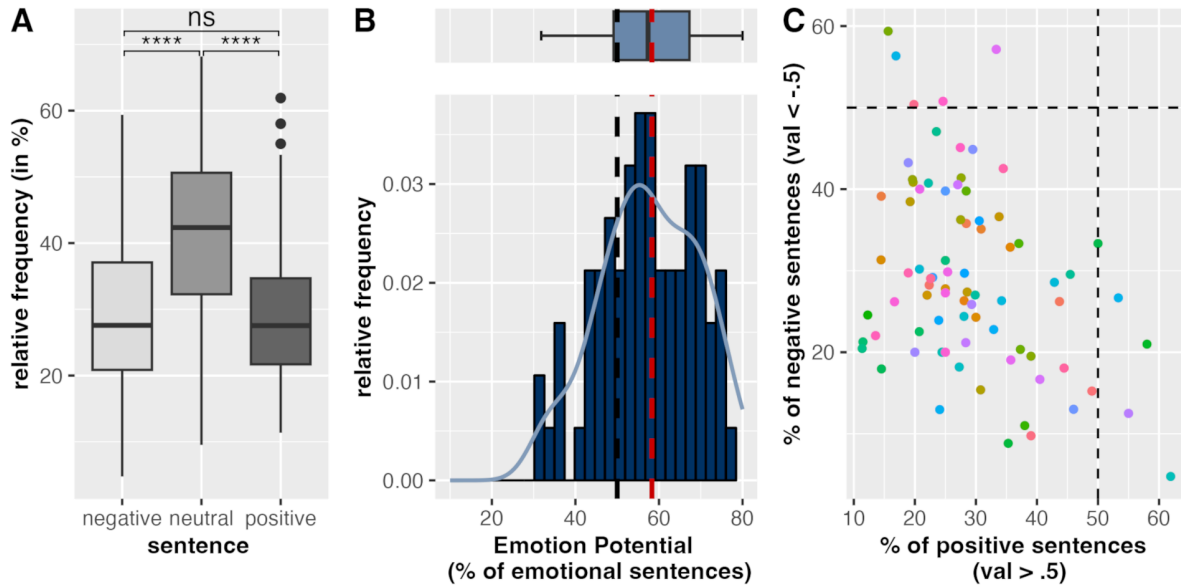[105] Cf. Schwarz-Friesel 2017; Hillebrandt 2011; Winko 2022.

Fig. 2: A – Relative frequency of the negative, neutral, and positive sentence (in %) in all fairy tales and the results of pairwise comparisons, B – Histogram and boxplot for the Emotion Potential (relative frequency (in %) of emotional sentences in the fairy tales, black dashed line indicates 50 %, red dashed line indicates the overall corpus $mean_{EP}$ = 58.31), C - Scatterplot of the relative frequency of positive and negative sentences (in %) per fairy tale (individual texts coded by color, dashed lines indicate 50 %). [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

To further explore the differences between the fairy tales, we also compared the amount of positive and negative sentences within each fairy tale. A visualization can be found in the scatter plot in Figure 2C, indicating substantial differences. Some fairy tales are predominantly positive, for example *The Three Brothers* or *The Elves* (depicted to the right of the black dotted auxiliary line), others are predominantly negative, like *The Godfather* or *Frau Holle* (depicted above the black dotted auxiliary line). The majority of texts, however, comprises both positive and negative sentences and can thus explain the Average Valence around zero. This raises the question of the role that textually encoded emotions play in the narrative progression of a single text, which we address in the next section.

4.1.3 Emotional Arcs

In order to address the text-internal variation of emotions, we computed *Emotional Arcs* that visualize the trajectory of emotion over narrative time. Based on computational analysis of more than 1,000 books, Reagan and colleagues[106] proposed six basic shapes of emotional trajectories or emotional arcs. They calculated average happiness scores for text segments with the text-based *hedonometer* (measuring joy) developed by Peter Sheridan Dodds and colleagues,[107] using different time series decomposition methods to identify core emotional arcs. Similarly, Evgeny Kim and colleagues analyzed the emotion trajectories in various genres for different discrete emotions, including the six basic emotions annotated in this project.[108] Unlike Reagean and colleagues, however, their analyses show that trajectories for fear, but not for joy, are the most uniform and informative.[109]

To integrate the results of both approaches, we compute Emotional Arcs based on valence annotations, since valence is, in contrast to basic emotions, theoretically considered as bipolar. This is supported by the seminal study of Bestgen,[110] who used valence ratings at sentence level to illustrate the emotional curve or profile of a story. How do we calculate the Emotional Arcs? As they approximate the ›emotional development‹ within a story at a macro level, we applied *discrete cosine transformation* (DCT),[111] a transformation and dimension reduction technique in signal processing, widely used also within natural language processing and sentiment analysis.[112] DCT was applied by using the dct-function of the *emuR* package in *R*.[113] Taking into account that the shortest

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[106] Cf. Reagan et al. 2016, p. 7.
[107] Cf. Dodds et al. 2011.
[108] Cf. Kim et al. 2017.
[109] Cf. also Archer / Jockers 2016, p. 94, who propose seven basic plots.
[110] Bestgen 1994, p. 33.
[111] Ahmed et al. 1974.
[112] For example in Jockers' syuzhet package (Jockers 2020a).
[113] Cf. Winkelmann et al. 2017.

of the annotated fairy tales has six sentences, we used the DCT-function with m = 5 to reconstruct a smoothed version of the valence annotations. Using the DCT-function also allowed a length normalization.[114] We therefore transformed the narrative time indicated by the position of a sentence in a text to a uniform window reaching from 1 to 100.[115] Figure 3 depicts the so obtained Emotional Arcs for all fairy tales.
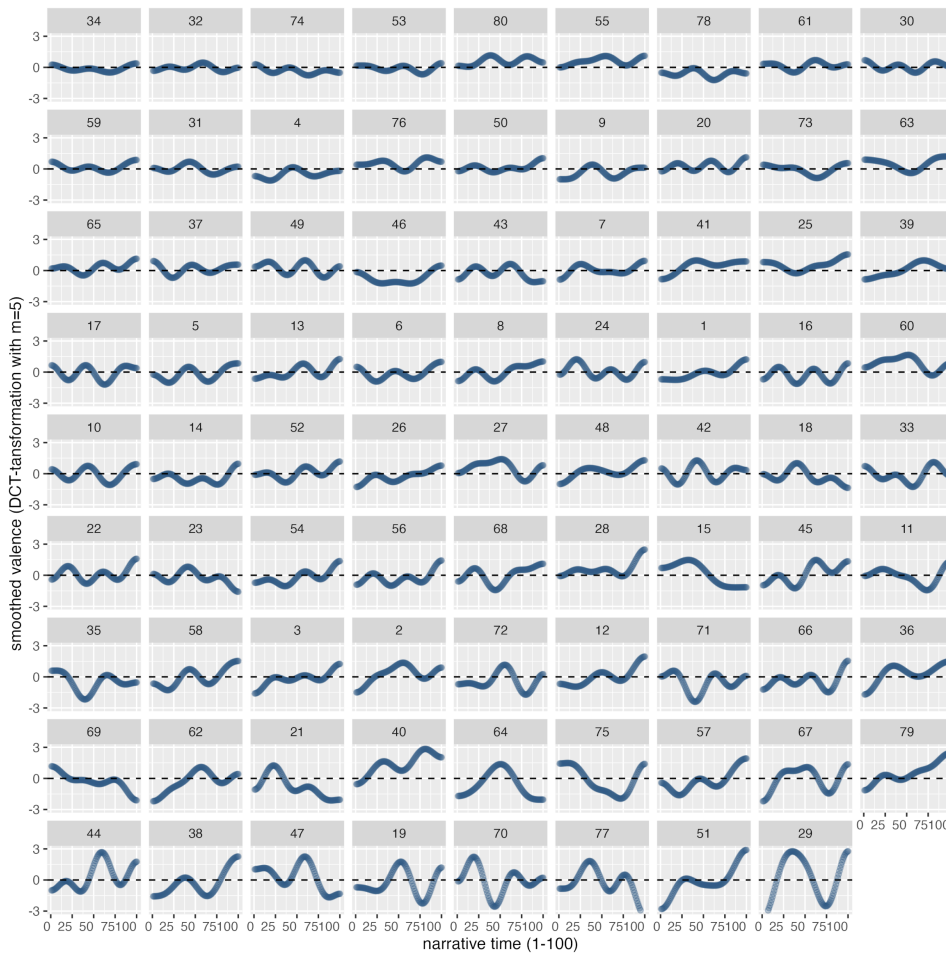

Fig. 3: Emotional Arcs of all fairy tales in *ChildTale-A* based on DCT-smoothed valence annotations. Narrative time is normalized to a time window from 1 to 100. The Emotional Arcs are ordered according to the ascending range of the emotion trajectories, defined as the difference between the highest and lowest smoothed valence value. The assignment of the IDs to the fairy tales can be found in Table S1. Black dashed lines indicate the theoretical mean of the valence scale. [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

The Emotional Arcs in Figure 3 are ordered by the range observed in the DCT-smoothed valence annotations, i. e. the difference between the highest and lowest value in the arc. Besides differences in the patterns of up and downs, the range seems to be an important characteristic of the Emotional Arcs. However, one should bear in mind that the range of the Emotional Arcs is correlated with the length of the tales, a correlation that is an artifact of the used DCT-function: Applying DCT with the fixed parameter m = 5 to all fairy tales means that in short (as compared to long) fairy tales the transformed data are closer to the original raw data and therefore less smoothed. The artificial nature of the smoothing is visible in Figures 4A and 4B: It shows that correlation between range and story length is significantly negative (r = -.49, p < .001, see Figure 4A), while the correlation between story length and the range of the original valence annotations (also called *valence span*)[116] indicates a positive relationship (r = .42, p = .001, see Figure 4B).

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[114] Elkins compares the pros and cons of some smoothing algorithms used to model emotional arcs (cf. Elkins 2022, p. 27). Although she criticizes DCT because of the dependence of the final shape of the arc on the selected parameter for m, she used that method together with a length normalization to calculate simplified macro shapes.
[115] The DCT-smoothed data can be found in our Zenodo repository (Lüdtke / Herrmann 2023).
[116] Cf. Jacobs 2015, p. 5.

To test whether DCT is nevertheless an appropriate algorithm for creating the Emotional Arcs, we calculated the correlation between the range of the Emotional Arc of each fairy tale and its Emotion Potential (see Figure 4C), which is significantly positive ($r = .42$, $p = .001$). For fairy tales with low Emotion Potentials we observe Emotional Arcs with small ranges (that means flat lines), while for fairy tales with high Emotion Potentials we observe Emotional Arcs with high ranges (pronounced ups and downs). This supports DCT as an adequate smoothing method.
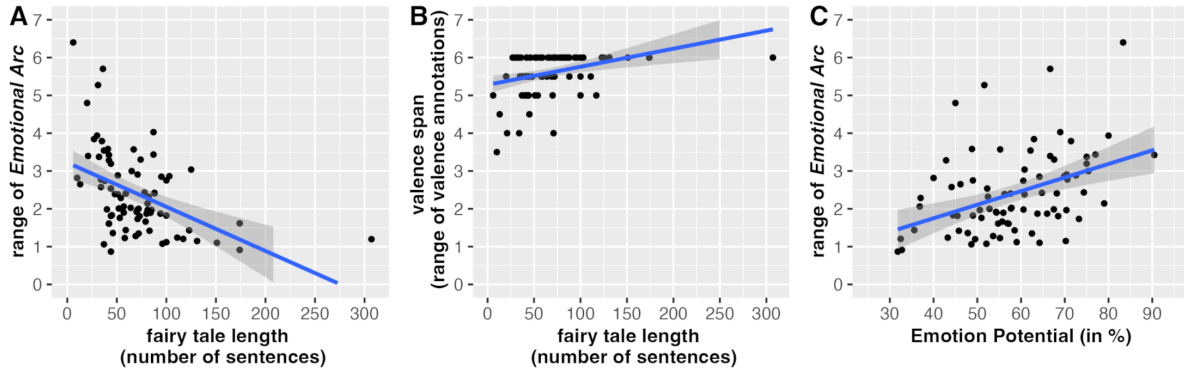
Fig. 4: Relationship between fairy tale length and range of DCT smoothed valence annotations (A), fairy tale length and range of the original valence annotations (valence span) (B), and Emotion Potential (percent of positive and negative sentences) and range of the DCT smoothed valence annotations (C). [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

To illustrate the positive relationship between the Emotion Potential and the range of the curvature of the Emotional Arcs, Figure 5 depicts the trajectory of the valence annotations of the sentences and the Emotional Arc for one fairy tale with a low (*The Strange Musician*, ID34)[117] and one with a high Emotion Potential (*Cinderella*, ID02). Also ID02 is considerably longer than ID34, the range of the Emotional Arc is bigger, making an extant curvature and a clear profile visible.
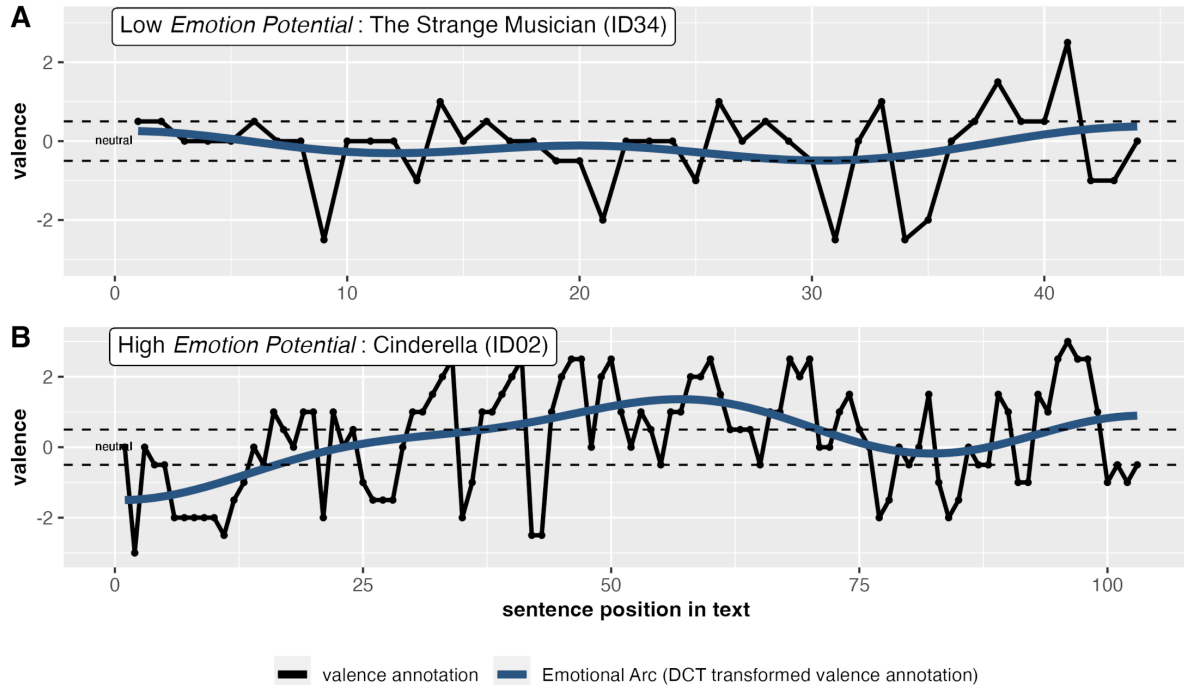
Fig. 5: Trajectory of the changes in the original valence annotation (values between the dashed auxiliary lines correspond to sentences annotated as neutral) and the trajectory of the Emotional Arc, i. e. the DCT-smoothed valence annotations ($m = 5$) for the fairy tales ID34 and ID02. [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

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[117] Each fairy tale in *ChildTale-A* received its own ID, which we use in the following. For assignment of title to ID, see Tab. S1 in the appendix.

In the following, we address some noticeable characteristics of the Emotional Arcs by focusing on the most extreme cases of Figure 3, the fairy tales *The Strange Musician* (ID34), characterized by a flattened curve, and *Sweet Porridge* (ID29) characterized by the most pronounced curve.

As described above, one reason for the pronounced *rise-fall-rise* pattern in ID29 lies in its brevity, as ID29 is with six sentences the shortest fairy tale in the *ChildTale-A* corpus.[118] But independently of the shortness, almost all of the sentences (five out of six) bear clear emotions resulting in an Emotion Potential of 83 %. We are thus dealing with a condensation of a prototypical folk narrative, in which a situation of deficiency (an already poor mother-daughter couple has run out of food) first turns to the better (the girl ventures out in the woods and meets an old lady who gives her a magic item, a pot that prepares sweet millet porridge at a command and stops again at another command; from then on, they never have to go hungry again). But then things turn for the worse again (one day the girl is out of the house, and the mother brings the pot to cook, but forgets the second command, so the pot buries the whole town/world under porridge). Eventually, the story turns to the better again, when the child comes home and tells the pot to stop: The town is turned into a kind of *Schlaraffenland* (›land of plenty‹), where all visitors have to eat themselves through the porridge, which is not a menace anymore, but rather an edible wall that protects the town.

Compared to the six basic shapes proposed by Reagan and colleagues,[119] we thus identify the rise-fall-rise pattern, which Reagan and colleagues match onto the iconic fairy tale *Cinderella*. Since *Cinderella* is also part of *ChildTale-A* (ID02, see Figure 5B), we can directly compare the Emotional Arc with the basic shape proposed by Reagan and colleagues. And indeed, the Emotional Arc follows the same basic shape, though in a less prototypical way. ID02 starts with the predicament of the young girl being confronted with evil step-sisters and an uncaring step-mother and her alliance with the birds that help her first with the sorting of the lentils and later by producing beautiful dresses and shoes – all of which allows her to attend the prince's dance (rise). Then, the drastic actions of her step-family to fit the shoe (cutting toes and heel) present a fall, followed by another rise when the prince understands that Cinderella, not the sisters, is the true dancer. In our annotations the local drop refers to the punishment of the step sisters, who are blinded by the birds.

At the other extreme of Figure 3, we find *The Strange Musician* (ID34), which shows comparably small oscillations in the Emotional Arc. The difference between the most negative and most positive points in the Emotional Arc is only 0.87 (compared to 2.86 for *Cinderella* and 6.4 for *Sweet Porridge*). Tale ID34 includes 68 % sentences annotated as ›neutral,‹ it is therefore the tale with the lowest Emotion Potential in the *ChildTale-A* corpus (see Table S1). This low value fits well with the trivial plot and the initial problem: A fiddler, who gets bored walking alone, and thus wishes for a companion, which he tries to attract by playing music (»I'm growing bored here in the forest, I want to fetch a good journeyman«). In three successive narrative events, a wolf, a fox, and a bunny appear, each of whom wishes to learn how to play the fiddle, but each of whom is not the companion the man is looking for. To get rid of them, he misleads and fixates each animal physically, but then gets bored again. Figure 5A depicts the trajectory of the Emotional Arc and the original valence annotations per sentence for ID34. The first small valence dip around sentence no. 9 is related to the encounter with the wolf, the fiercest of the animals, who is tied up with a rather *brute* action involving a rock, whereas the successive events involve increasingly harmless animals (fox and bunny). The next slightly pronounced dip around sentence 34 and 35 is the wolf freeing first himself and then the other animals, blaming the musician and setting out to hunt »their enemy:« From the perspective of the main character, this is a moment of danger, corresponding therefore with the clearer dip. Finally, the rise towards the end of the plotline corresponds with the appearance of a new character (a poor woodcutter, sentence 39), and his enchantment by the fiddler's beautiful music. This character is finally accepted by the fiddler as the right kind of companion. When the animals appear, »intending evil,« the woodcutter defends the fiddler with his ax. Overall, the plot in ID34 is less drastically emotionally encoded, corresponding with its motive of taking a stroll and looking for leisure. In the story, the realms of animals and mankind are presented as clearly separated, so the threat of the angry animals is not severe: It is not a story of ›life and death,‹ by contrast to *Sweet Porridge*. This is relevant, as the annotators were instructed to take into account the meaning of the whole text, and not just each sentence alone. As depicted in Figure 5A, the weight of a single clearly emotional sentence is mediated by neutral filler sentences. The overall emotional trajectory, although with comparably small oscillations, is that of *fall-rise-fall-rise*. This pattern does not directly match onto one of the six basic shapes reported by Andrew Reagan and colleagues.[120]

In sum, Figure 3 shows that the Emotional Arcs vary considerably. We find different types of trajectories across the *ChildTale-A* corpus, with variance concerning both sequencing and amplitude of valence. While some of the observed plotlines can be matched onto the six basic shapes identified by Andrew Reagan and colleagues,[121] others cannot. To answer questions about

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[118] For an overview of main results per text, see Table S1, Appendix.

[119] Reagan et al. 2016, Fig. 4, p. 7. The ›story shape‹ research goes back to anthropological work by — among others — Vladimir Propp and Claude Levi-Strauss. From these symbol- and form-oriented approaches, Kurt Vonnegut distilled his thesis that all stories have simple shapes, something which he explored in a (rejected) Master's thesis and in (youtube) lectures on the example of Cinderella, for example Comberg 2010; cf. Elkins, 2022.

[120] Cf. Reagan et al. 2016, p. 7

[121] Cf. Reagan et al. 2016, p. 7.

the predominant shapes for CHT and their relation to the basic shapes described by Reagan et al., further analysis including different smoothing algorithms[122] in combination with hierarchical cluster analyses are necessary, which we will leave for a later publication. In general, future research on narrative patterns using our method based on valence annotations per sentence thus appears promising. So far, we have concentrated on a dimensional model of emotion. In the last analysis, we examine the distribution of discrete emotions.

4.1.4 Emotion Profiles

Hermeneutic approaches as well as computational analysis of fairy tales often focus on discrete emotions, asking about their textual distribution and their role for the narrative plot.[123] We used the collected annotations for six discrete basic emotions to assess what we call the *Emotion Profile*, i. e. the relative frequency of each emotion. The Emotion Potential is calculated by dividing the number of sentences in which a basic emotion is identified by the total number of sentences of the particular fairy tale. Figure 6 depicts the aggregated Emotion Profile for the *ChildTale-A* corpus as a whole. On average, we observed joy as a predominant basic emotion with a *mean* = .34 (*SD* = .17), indicating that joy is encoded in around one third of the sentences of each of the fairy tales. Moreover, joy was annotated in every fairy tale at least in two sentences. All other five basic emotions are observed less often and also do not occur in every fairy tale. By a substantial gap, the second most frequent basic emotion is surprise (*mean* = 0.21, *SD* = 0.10), closely followed by sadness (*mean* = 0.18, *SD* = 0.10), fear (*mean* = 0.17, *SD* = 0.11), and anger (*mean* = 0.11, *SD* = 0.09). The by far lowest occurrence was observed for disgust (*mean* = 0.02, *SD* = 0.04), which was identified in only *n* = 38 out of the *N* = 80 fairy tales (in at least one sentence). The comparison of the mean values for the relative frequencies of the six basic emotions with the overall mean in the *ChildTale-A* corpus (*mean* = 0.17, *SD* = 0.15) underlines that joy and surprise are both significantly overexpressed, while anger and disgust are significantly underexpressed in statistical terms.[124]
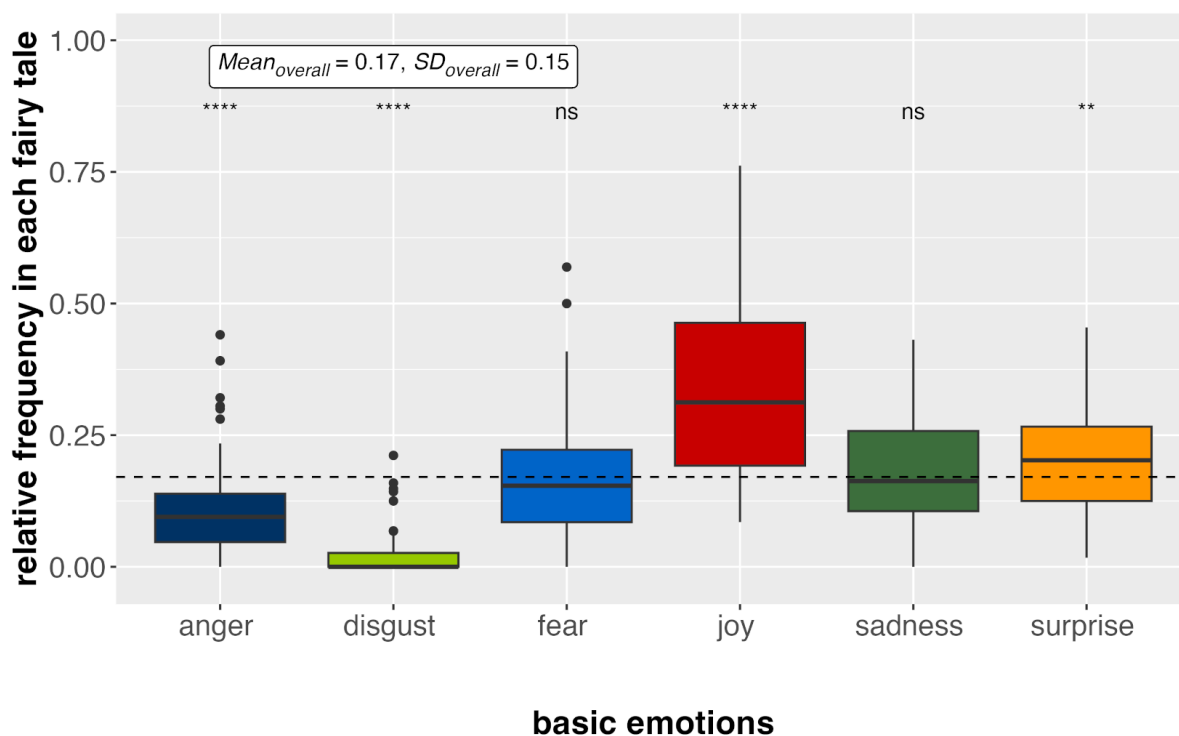
Fig. 6: Boxplots of relative frequencies of the six basic emotions in all fairy tales (absolute frequencies divided by number of sentences per fairy tale). Dashed line represents the overall mean. Mean values of each basic emotion are compared to overall mean. [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

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[122] Cf. Elkins 2022, p. 35.
[123] Examples are respectively Lange 2016 and Alm / Sproat 2005. Meanwhile, reliable identification of discrete emotions in fictional and artistic texts is a challenge for several reasons, such as the context-dependence of meaning, but also the fuzzy boundaries between single emotions, and finally their partly rare occurrence (see 3.3.2).
[124] Comparing the mean values for relative frequency with each other indicated also significant differences ($|t_{all}| > 3.8$, $p_{all} < .001$) except for the relative frequencies of fear, sadness and joy ($|t_{all}| < 2.5$, $p_{all} > .09$). P-values for multiple pairwise paired t-tests are adjusted using the Bonferroni correction.

While both the annotation-based study by Alm and Sproat[125] and the dictionary-based sentiment analysis by Rotari[126] describe a rare occurrence of disgust, their frequency patterns for the other emotions differ. For example, joy as predominant emotion in *ChildTale-A* was also observed by Rotari, while Alm and Sproat reported the highest prevalence for anger. Surprise, the second most frequent basic emotion in *ChildTale-A*, was observed very rarely by Rotari, while Alm and Sproat reported intermediate frequencies.

There are at least four potential reasons for these differences that relate to data and method: First, Alm and Sproat reported results for only »a preliminary tie-broken data set of 22 Grimms' fairy tales«[127] without information on which fairy tales were annotated, whereas Rotari analyzed $N = 145$ of the *CHT*s, including such subgenres as the ›Schwank,‹ which was excluded in the present study because of a different emotional structure. These differences in the setup of the three corpora are thus likely to have caused different overall profiles, something which is supported by our observation of fairy tales varying substantially in the occurrence of single basic emotions (see Figure 8). Second, Rotari used an automated dictionary-based annotation at word level, which could not capture implicitly encoded emotions, something the annotators in our study took into account. Third, while our annotators could indicate more than one basic emotion in a sentence, Alm and Sproat used an exclusive coding. Analyzing our annotations for joint occurrences indicated that in 26 % of all sentences more than one basic emotion was coded (compared to 49 % sentences for which only one basic emotion was annotated). And fourth, there are also differences in the used coding schema. Alm and Sproat, for example, split the basic emotion surprise into positive and negative surprise, while we used only one category, following the definition of *surprise* as an emotional reaction evoked by »unexpected (schema-discrepant) events.«[128]

To better understand the Emotional Profile of the *ChildTale-A* corpus, we calculated correlations between the relative frequencies of all six basic emotions (see Figure 7). All significant relationships are positive, indicating co-occurrences, with the strongest one observed for joy and surprise ($r = .49$), and slightly weaker ones for joy and sadness ($r = .35$), and for fear and anger ($r = .28$). All other relationships are not significant.

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[125] Alm / Sproat 2005.
[126] Rotari 2018.
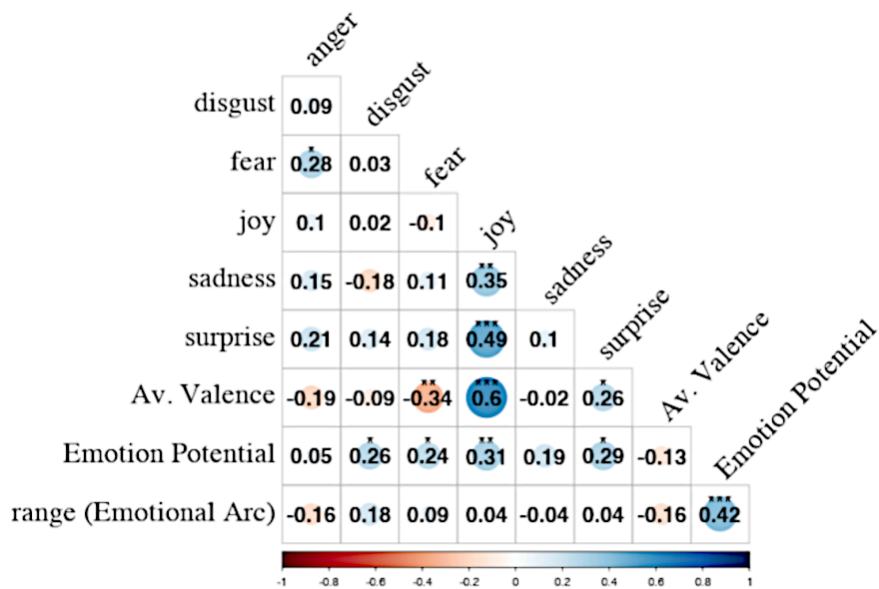[127] Alm / Sproat 2005, p. 5.
[128] Reisenzein et al. 2019, p. 50.

Fig. 7: Correlation matrix with spearman correlation coefficients between the relative frequency of the six basic emotions, the Emotion Potential (percent of emotional sentences), Average Valence, range in the Emotional Arc (the DCT-smoothed valence values), and length (number of sentences) for all fairy tales (higher positive and negative correlation coefficient are marked red or blue, respectively; significant values are marked with asterisks: * *p* < .05, ** *p* < .01, *** *p* < .001). [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

In addition to the overall occurrence of the six basic emotions, we calculated the Emotional Profiles for each single fairy tale. These profiles (Figure 8) demonstrate some similarities, but also clear differences across the corpus. As described above, joy (red bars) is part of each Emotional Profile. In about half of the profiles joy is the predominant emotion (for example ID2 or ID40), often flanked by surprise (yellow bars), an observation which is also expressed by the significant positive correlation between the relative frequencies of both. There are also some fairy tales in which joy and surprise appear as rarely as the other basic emotions (for example ID35 or ID62). A small group of fairy tales is characterized by fear (light blue bars) being the most prominent emotion (for example ID74 and ID71). In another small group, sadness (dark green bars) is the dominant one (for example ID53 and ID46). There are no fairy tales dominated by anger (dark blue bars) or disgust (light green bars), at least not in terms of frequency of occurrence.
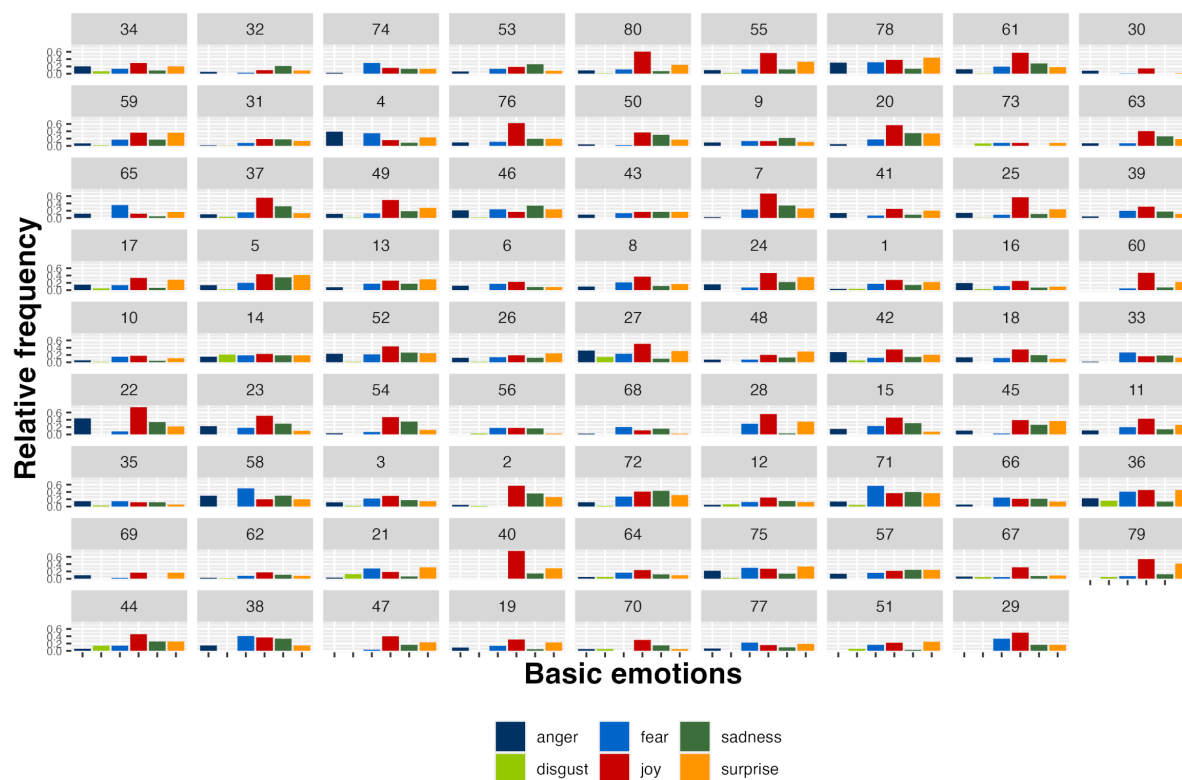
Fig. 8: Emotion Profiles for all fairy tales in *ChildTale-A*. Fairy tales are ordered as in Figure 3, according to the range of the Emotional Arcs (the difference between the highest and lowest DCT-smoothed valence values). For the legend of the fairy tale IDs, see Table S1. [Graphic: J. Berenike Herrmann / Jana Lüdtke 2023]

Taken together, the Emotional Profile of the *ChildTale-A* corpus (see Figure 6), as well as many of the individual profiles of the single fairy tales (see Figure 8) are characterized by an above average occurrence of joy. On the one hand, the dominance of joy may be explained at least in part by the fact that joy is the only clearly positive emotion category, while negative affect is differentiated into four distinct categories. This imbalance is visible in the majority of basic emotion theories and some researchers view this fact as a negativity bias based on a »greater cognitive elaboration of negative events.«[129] On the other hand, the dominance of joy could also be interpreted as an indication of a positivity bias, often discussed as the *Pollyanna effect*.[130] According to Jacobs et al., this higher frequency of positive compared to negative words and sentences, is the result of »a universal human tendency to use evaluatively positive words more frequently, diversely and facilely than evaluatively negative words.«[131] Jacobs et al. reported this effect for contemporary German children's and youth literature.[132] The results of our annotations of discrete emotions indicate that this universal tendency is also visible at the semiotic level in the Grimms' *CHT*, even though it seems to be somewhat weaker: there is no positivity bias in the valence annotations (see Figure 1). Nevertheless, further hermeneutic and narratological analysis should focus on both negative and positive emotions in narrative structure, especially in relation to events. While negative emotions may function as drivers of action,[133] positive emotions appear to correlate with narrative stasis, which might mean that they redress the level of ›eventfulness‹ in the sense of Michael Vauth and colleagues,[134] ›re-balancing‹ valence to a relatively enjoyable status quo,[135] that may then be overthrown again as the story unfolds – or lead to a happy ending. So far, much more research has been dedicated to negative emotions. We thus think it is interesting to point to the role of positive emotions, starting with a distributional profile, but extending to their functional roles in counterbalancing the negative emotions in the unfolding of the plot.

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[129] Rozin / Royzman 2001, p. 310.
[130] Cf. Dodds et al. 2015; Green 2017.
[131] Jacobs et al. 2020, p. 1.
[132] Cf. Jacobs et al. 2020.
[133] Cf. Horn 2016a.
[134] Vauth et al. 2021, p. 337.
[135] Alm / Sproat 2005 suggest that »a happy emotion expresses contentment with the status quo, whereas negative events force action and keep the narrative plot going« (p. 7).

As *ChildTale-A* is to the best of our knowledge the only annotated literary corpus with annotations for both discrete basic emotions as well as the dimension valence, we explore in a last step the relationship between both annotations. Figure 7 depicted the correlation between the relative frequencies of the six basic emotions and the different measures derived from the valence annotations, the Average Valence, the Emotion Potential and the range of the Emotional Arc. In line with the described predominance of joy, the strongest correlation could be observed between Average Valence and the relative frequency of joy (r = .06). Fairy tales with a higher relative frequency of joy are characterized by higher Average Valence values indicating the tendency to be more positive. As one would expect, the correlation between the relative frequency of fear and Average Valence is negative (r = -.34) being the only significant correlation between a distinct negative emotion and Average Valence. The relative frequencies of joy, surprise, disgust and fear correlate significantly positively with the Emotion Potential (r_{all} > .24), the percentage of both positive and negative sentences in a fairy tale. Also for sadness and anger, no significant relationship could be observed, the valence annotation and the annotation for the discrete emotions seem to correspond very well. For more than 85 % of the sentences categorized as positive or negative (done based on the valence annotations), the annotators detected at least one basic emotion (see Table 3). For 10 % or 12 % respectively, no basic emotion were annotated reflecting, at least in part, that not all emotions expressed at the semiotic level are covered by the six basic emotion categories. More interestingly, for only 56 % of the sentences categorized as neutral, none discrete basic emotion was encoded. For the remaining 44 % at least one basic emotion was encoded. Comparable to our interpretation of the overall mean of Average Valence, valence annotations around zero at the sentence level are not in every case a sign of an absence of emotions. Instead, valence annotations around zero could also be an index of emotional ambiguity due to an co-occurence of both positive and negative emotional episodes or events.

discrete basic emotion	sentence		
	negative	neutral	positive
none annotated	11.85 %	44.13 %	10.36 %
at least one annotated	85.15 %	55.87 %	89.64 %
column sum	100 %	100 %	100 %

Tab. 3: Relative frequency (in %) of the (non-)occurrence of the six basic emotions for negative, neutral, and positive sentences.

5. Conclusions and Outlook

The goal of the present study was to examine at a semiotic level the emotions encoded in a corpus of eighty German fairy tales constituting the *ChildTale-A* corpus[136]. The corpus represents the core genre of 19th Century folk tales, *Animal and Magic Tales*, a subcollection of the *Children and Household Tales* published by the Brothers Grimm in the last edition in 1857. To identify emotions, we annotated the strength of valence and arousal as well as the occurrence of the six basic emotions anger, disgust, fear, joy, sadness and surprise for each single sentence per text. The annotations were used to introduce four different measures, characterizing the emotion potential and the trajectories of emotional changes within fairy tales: Average Valence, Emotion Potential, Emotional Arc, and Emotion Profile.

In sum, our results indicate that the Grimms' fairy tales are not particularly ›dark,‹ as assumed by some. Our results rather support the assumption that fairy tales are an optimistic genre in the sense of Bausinger, as the corpus mean for Average Valence is in a neutral range. This neutrality at the macro level is not a result of missing emotional content. It rather reflects an often equal amount of positive and negative sentences visible in the proportion of positive and negative sentences constituting the Emotion Potential. The overall neutrality, however, may indicate that a great part of the sentences annotated in our corpus are comparatively less highly emotionalized, as supported by folklore research that finds the prototypical fairy tales ›less clearly emotional‹ than legends, fables, or artistic fairy tales. Whether the amount of neutrality observed in our corpus indeed is a unique feature of that highly schematic historical genre awaits further quantitative comparison with contemporary children's literature.

This comparison should also focus on the co-representation of different emotions at the sentence level: in *ChildTales-A*, almost half of all emotional sentences encode just one discrete emotion. This again appears to indicate the simple schematic structure of the folk tale and perhaps might constitute a measurable feature when compared to other genres. The Emotional Arcs calculated on the basis of the valence annotations per sentence indicate substantial variation of trajectory patterns across the corpus: While some fairy tales are characterized by flat trajectories and minor changes on the valence dimension, others show substantial

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[136] All data are available in our Zenodo repository (Lüdtke / Herrmann 2023).

oscillations, especially tales with a high Emotion Potential. Some, but not all, of the oscillation patterns are in line with the prototypical patterns described by Reagan and colleagues.[137] The Emotion Profiles based on the occurrences of six basic emotions indicate that joy is the most dominant basic emotion, which gives support for the Pollyanna effect documented by Jacobs and colleagues.[138] However, based on the emotion profiles of individual fairy tales in *ChildTales-A*, it is noteworthy that in only 50 % of the annotated tales joy is quantitatively predominant, while the rest of the tales is coined by predominant fear or anger, or by absence of a prevailing emotion. Together, our data suggest the hypothesis that emotionally encoded sentences may correlate with a degree of ›eventfulness.‹[139] Further in-depth analysis should prove whether negative emotions (such as fear) are indeed drivers of action, while positive emotions may cater to a ›re-balancing‹ of valence to a relatively enjoyable (transitory) status quo,[140] often to be overthrown in the following succession of events.

Taken together, *ChildTale-A* and the four introduced measures represent a rich data set for more fine-grained analyses. The annotations for more than 5,000 sentences are a comfortable starting point for training supervised machine learning algorithms (classifiers) that can predict sentiment in further fairy tales and potentially other texts. Our data are suitable to test the applicability of existing sentiment analysis tools on literary texts that were first developed in other domains. Moreover, and to the best of our knowledge, ours is the first data set providing both annotations for the valence dimension and annotations for basic emotions. The dataset therefore opens the field to further exploration of the relationship between two theoretical approaches of discrete versus dimensional models of emotions.

Limitations of our study include a lower than ideal inter-rater agreement especially for discrete emotions, a problem which is shared by the field, as well as the fundamental problem of how to reliably model literary expert knowledge into a specific set of instructions. Our approach was to monitor representation of genre knowledge (by giving prompts as to the lack of psychologization, schematic meaning and focalization) and story meaning (by reading the whole text) through the instructions. The general challenge of reliably identifying text meaning points to a full(er) representation of the text surface, the propositional text base, and different types of inferences which necessarily presuppose genre knowledge (see Section 3.2). However, such representations appear still beyond the control of study design even for a simple genre such as the Grimms' tales that does not involve much interpretative inferences, both for manual annotation and for deep machine learning. Yet, our study takes a step ahead, as the provided annotations promise to be useful for more in-depth narratological analysis as well as for empirical studies of reader response. Future studies about the role of emotions in literary texts would benefit from focusing not only on the forms, functions, and representations of negative, but also on those of positive emotions.

Acknowledgements

Appendix and Supplementary Material

All data, including the scripts for preparing annotations and preprocessing, as well as original instructions for annotation of *ChildTale-A* are available in our Zenodo repository (Lüdtke / Herrmann 2023).

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[137] Cf. Reagan et al. 2016, p.7.
[138] Cf. Jacobs et al. 2020.
[139] Cf. Vauth et al. recently proposed a continuous metric to operationalize eventfulness ranging from non-event to high narrativity in the sense of changing states (Vauth et al. 2021, p. 337).
[140] Alm / Sproat 2005 suggest that »a happy emotion expresses contentment with the status quo, whereas negative events force action and keep the narrative plot going« (p. 7).

ID	German title	English title[1]	CHTIndex	text length	Average Valence (scaled from -3 until 3)	Percent positive sent.	Percent negative sent.	Percent neutral sent.	Kripp. α (valence)
1	Allerleirauh	All-Kinds-Of-Fur	65	85	-0.14	22.35	28.24	49.41	.40
2	Aschenputtel	Cinderella	21	103	0.26	43.69	26.21	30.1	.56
3	Brüderchen und Schwesterchen	Little Brother and Little Sister	11	95	-0.16	28.42	35.79	35.79	.59
4	Das blaue Licht	The Blue Light	116	69	-0.49	14.49	39.13	46.38	.52
5	Das Mädchen ohne Hände	The Girl without Hands	31	94	-0.18	30.85	35.11	34.04	.68
6	Das Meerhäschen	The Rabbit	191	57	-0.13	28.07	26.32	45.61	.45
7	Das singende springende Löweneckerchen[2]	The Singing, Springing Lark	88	73	0.08	35.62	32.88	31.51	-
8	Das Waldhaus	The Hut in the Woods	169	70	0.06	30	24.29	45.71	.58
9	Das Wasser des Lebens	The Water of Life	97	83	-0.34	14.46	31.33	54.22	.70
10	Daumerlings Wanderschaft	Thumbling's Travels	45	72	-0.06	25	27.78	47.22	.60
11	Daumesdick	Thumbthick	37	100	-0.11	22	27	51	.58
12	Der Baerenhäuter	Bearskin	101	71	-0.01	33.8	36.62	29.58	.76
13	Der Eisenofen	The Iron Stove	127	84	0.01	28.57	27.38	44.05	.54
14	Der Froschkönig oder der eiserne Heinrich	The Frog King. or Iron Heinrich	1	52	-0.42	19.23	38.46	42.31	.75
15	Der Fuchs und die Frau Gevatterin	The Fox and His Cousin	74	13	0.15	30.77	15.38	53.85	.24
16	Der Geist im Glas	The Spirit in the Glass Bottle	99	71	-0.27	19.72	40.85	39.44	.69
17	Der gelernte Jaeger	The Trained Huntsman	111	80	-0.08	27.5	36.25	36.25	.88
18	Der Gevatter Tod	Godfather Death	44	51	-0.27	19.61	41.18	39.22	.73
19	Der gläserne Sarg	The Glass Coffin	163	87	-0.32	27.59	41.38	31.03	.72

Tab. S1: Overview of all annotated fairy tales in *ChildTale-A* (*N* = 80): ID (used in Figures 3 and 5), German and English title, CHT-Index, text length (number of sentences), Average Valence (mean of valence annotations of all sentences), percentages of negative, neutral, and positive sentences (sent.), and Krippendorff's alpha (Kripp. α) for valence annotations of the sentences.

20	Der golde-ne Vogel	The Golden Bird	57	123	0.26	39.02	19.51	41.46	.68
21	Der Herr Gevatter	The Godfa-ther	42	32	-0.77	15.63	59.38	25	.77
22	Der Hund und der Sperling	The Dog and the Sparrow	58	59	0.13	37.29	20.34	42.37	.22
23	Der König vom golde-nen Berg	The King of the Golden Mountain	92	88	-0.23	28.41	39.77	31.82	.81
24	Der Kö-nigssohn der sich vor nichts fürchtet	The King's Son Who Is Afraid of Nothing	121	81	0.12	37.04	33.33	29.63	.73
25	Der Krautesel	The Cabba-ge-Donkey	122	100	0.51	38	11	51	.37
26	Der Liebste Roland	Sweetheart Roland	56	57	-0.25	12.28	24.56	63.16	.55
27	Der Ran-zen, das Hütlein und das Hörn-lein	The Knap-sack, the Hat, and the Horn	54	81	0.54	58.02	20.99	20.99	.38
28	Der Sper-ling und seine vier Kinder	The Spar-row and His Four Children	157	34	0.56	35.29	8.82	55.88	.39
29	Der süsse Brei	Sweet Por-ridge	103	6	0.17	50	33.33	16.67	.86
30	Der Teu-fel mit den drei golde-nen Haaren	The Devil with the Three Gol-den Hairs	29	117	0.08	14.53	17.95	67.52	.44
31	Der treue Johannes	Faithful Jo-hannes	6	111	0.01	20.72	22.52	56.76	.74
32	Der Trommler	The Drum-mer	193	174	-0.06	11.49	21.26	67.24	.51
33	Der Wolf und die sie-ben jungen Geislein	The Wolf and the Se-ven Young Kids	5	48	-0.09	25	31.25	43.75	.52
34	Der wun-derliche Spielmann	The Stran-ge Musician	8	44	-0.14	11.36	20.45	68.18	.64
35	Der Zaun-könig und der Baer	The Wren and the Be-ar	102	34	-0.56	23.53	47.06	29.41	.69
36	Des Teu-fels russi-ger Bruder	The Devil's Sooty Bro-ther	100	44	0.34	45.45	29.55	25	.74
37	Die beiden Wanderer	The Two Travelers	107	174	0.13	29.89	27.01	43.1	.52
38	Die Bienen-königin	The Queen Bee	62	27	-0.33	22.22	40.74	37.04	.75

Tab. S1: Overview of all annotated fairy tales in *ChildTale-A* (*N* = 80): ID (used in Figures 3 and 5), German and English title, CHT-Index, text length (number of sentences), Average Valence (mean of valence annotations of all sentences), percentages of negative, neutral, and positive sentences (sent.), and Krippendorff's alpha (Kripp. α) for valence annotations of the sentences.

39	Die Bremer Stadtmusi-kanten	The Bre-men Town Musicians	27	45	0.09	24.44	20	55.56	.46
40	Die drei Brüder	The Three Brothers	124	21	1.38	61.9	4.76	33.33	.68
41	Die drei Fe-dern	The Three Feathers	63	44	0.43	27.27	18.18	54.55	.68
42	Die drei Männlein im Walde	The Three Little Men in the Woods	13	82	0.06	28.05	24.39	47.56	.35
43	Die drei Schlangen-blätter	The Three Snake-Lea-ves	16	53	-0.25	20.75	30.19	49.06	.61
44	Die drei Spinnerin-nen	The Three Spinning Women	14	35	0.34	42.86	28.57	28.57	.67
45	Die drei Sprachen	The Three Languages	33	38	0.13	34.21	26.32	39.47	.73
46	Die Gaen-semagd	The Goo-se-Girl	89	71	-0.76	16.9	56.34	26.76	.79
47	Die Ge-schenke des kleinen Volkes	The Gifts of the Little People	182	30	0.28	53.33	26.67	20	.84
48	Die golde-ne Gans	The Golden Goose	64	54	0.19	24.07	12.96	62.96	.51
49	Die Gold-kinder	The Gold-Children	85	79	0.22	32.91	22.78	44.3	.66
50	Die Hoch-zeit der Frau Füch-sin	Mrs. Fox's Wedding	38	46	0.12	23.91	23.91	52.17	.78
51	Die Krys-tallkugel	The Crystal Ball	197	36	-0.13	30.56	36.11	33.33	.67
52	Die Nelke	The Carna-tion	76	64	0.06	28.13	29.69	42.19	.57
53	Die Nixe im Teich	The Nixie in the Pond	181	96	-0.11	22.92	29.17	47.92	.65
54	Die Rabe	The Raven	93	88	-0.2	25	39.77	35.23	.74
55	Die sechs Diener	The Six Ser-vants	134	100	0.6	46	13	41	.52
56	Die sechs Schwäne	The Six Swans	49	78	-0.25	29.49	44.87	25.64	.88
57	Die sieben Raben	The Seven Ravens	25	37	-0.27	18.92	43.24	37.84	.63
58	Die Was-sernixe	The Water Nixie	79	10	-0.05	20	20	60	.68
59	Die weisse Schlange	The White Snake	17	58	0.15	29.31	25.86	44.83	.47
60	Die Wich-telmänner	The Elves	39	40	0.83	55	12.5	32.5	.80
61	Die zwei Brueder	The Two Brothers	60	307	0.15	28.34	21.17	50.49	.41

Tab. S1: Overview of all annotated fairy tales in *ChildTale-A* (*N* = 80): ID (used in Figures 3 and 5), German and English title, CHT-Index, text length (number of sentences), Average Valence (mean of valence annotations of all sentences), percentages of negative, neutral, and positive sentences (sent.), and Krippendorff's alpha (Kripp. α) for valence annotations of the sentences.

62	Die zwölf Brueder	The Twelve Brothers	9	74	-0.28	27.03	40.54	32.43	.80
63	Dornrös-chen	Little Brier-Rose	50	42	0.49	40.48	16.67	42.86	.75
64	Frau Holle	Frau Holle	24	42	-0.55	33.33	57.14	9.52	.84
65	Fundevogel	Found-ling-Bird	51	42	0.27	35.71	19.05	45.24	.55
66	Hänsel und Grethel	Hansel and Gretel	15	125	-0.38	20.8	40	39.2	.66
67	Hans mein Igel	Hans-My-Hedgehog	108	67	-0.02	25.37	29.85	44.78	.76
68	Jorinde und Joringel	Jorinde and Joringel	69	44	0.02	25	27.27	47.73	.62
69	Katze und Maus in Gesell-schaft	Cat and Mouse in Partnership	2	42	-0.3	16.67	26.19	57.14	.27
70	Märchen von der Un-ke	Tales of the Toad	105	20	-0.05	25	20	55	.88
71	Marienkind	Mary's Child	3	65	-0.55	24.62	50.77	24.62	.86
72	Rapunzel	Rapunzel	12	51	-0.41	27.45	45.1	27.45	.90
73	Rothkäpp-chen	Little Red Cap	26	59	-0.08	13.56	22.03	64.41	.65
74	Rumpel-stilzchen	Rumpel-stiltskin	55	37	-0.34	18.92	29.73	51.35	.45
75	Schnee-weisschen und Rosen-roth	Snow-Whi-te and Ro-se-Red	161	87	-0.22	34.48	42.53	22.99	.83
76	Sechse kommen durch die ganze Welt	How Six Men Got On in the World	71	72	0.52	44.44	18.06	37.5	.71
77	Simeliberg	Simeli Mountain	142	31	-0.26	22.58	29.03	48.39	.88
78	Sneewitt-chen	Little Snow-White	53	131	-0.61	19.85	50.38	29.77	.65
79	Spindel, Weber-schiffchen und Nadel	Spindle, Shuttle, and Needle	188	41	0.51	39.02	9.76	51.22	.68
80	Tischchen deck dich, Goldesel, und Knüp-pel aus dem Sack	Table-Be-Set, Gold-Donkey, and Cud-gel-out-of-the-Sack	36	151	0,6	49.01	15.23	35.76	.59
				sum 5579	mean -0.008	mean 29.06	mean 29.26	mean 41.69	mean .64

[1] Titles are translated according to https://sites.pitt.edu/~dash/grimmtales.html
[2] For technical reasons this fairy tale was annotated by only one person.

Tab. S1: Overview of all annotated fairy tales in *ChildTale-A* (*N* = 80): ID (used in Figures 3 and 5), German and English title, CHT-Index, text length (number of sentences), Average Valence (mean of valence annotations of all sentences), percentages of negative, neutral, and positive sentences (sent.), and Krippendorff's alpha (Kripp. α) for valence annotations of the sentences.

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