# Love and Sex with Robots: A Content Analysis of Media Representations

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## Abstract

In his seminal book "Love and Sex with Robots", David Levy (Love and sex with robots: the evolution of human–robot relations, Harper, New York, 2007) predicted that intimate human–robot relationships will be normalized by 2050. So far, only a very small number of early adopters of love and sex robots has experienced these kinds of relationships. The majority of the population only learns about love and sex with robots through media representations, be they fictional (e.g., movies and TV series) or non-fictional (e.g., newspaper and magazine articles). The current study therefore aimed at analyzing the media representations of intimate human–robot relationships. The three research questions, based on Sexual Script Theory, addressed characteristics (1) of the involved human partner, (2) of the involved robot partner, and (3) of their mutual intimate relationship. A quota sample of $N = 710$ media examples from different genres (48% non-fictional, 52% fictional, originating from 1927 to 2014) was drawn and subjected to quantitative media content analysis. Results indicate that media representations of intimate human–robot relationships tend to portray the involved human partner as a man who is disadvantaged in interpersonal relationships. At the same time, media often portray the involved robot partner as a humanoid female sex robot. While non-fictional media describe intimate human–robot relationships more often in sexual terms, fictional media focus more on emotional aspects, cohabitation and even procreation between humans and robots. Overall, media representations of intimate human–robot relationships reveal stereotypical gender roles, heteronormativity and a focus on sexual versus emotional intimacy. Implications for the future development and use of love and sex robots are discussed.

**Keywords** Human–robot relationships · Sex robots · Media representations · Sexual script theory · Gender roles · Media content analysis

## 1 Introduction

In his seminal book "Love and Sex with Robots", David Levy [1] predicted that intimate human–robot relationships will be normalized by 2050 and that humans will even marry robots. Ian Pearson [2] recently proclaimed that humans will eventually prefer sex with robots over sex with their conspecifics.

As discussed by Levy [1], intimate human–robot relationships can be defined as sex and love with robots and therefore comprise of two aspects. The first one is *sexual intimacy*, meaning sexual relations with robots. The second one is *emotional intimacy*, meaning emotional attachment, falling in love with and loving a robot [3].

So far, only a very small number of early adopters of love and sex robots might have experienced these intimate human–robot relationships, though. The majority of the population only learns about love and sex with robots through *media representations*, be they fictional (e.g., movies and TV series) or non-fictional (e.g., newspaper and magazine articles; [4]).

Fictional media have been representing love and sex with robots for a long time. The phantasy of having sex with a robot has inspired art from early on. One of the first examples would be the movie "Metropolis" by Fritz Lang, which premiered in 1927. In this movie, the gynoid Machine-Maria beguiles upper-class men with her erotic dancing, leading to duels, murder, and suicide between them. The novel "Forward the Foundation" by Issac Asimov (published posthumously in 1993) tells the story of Hari Seldon (considered

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as Asimov's literary alter ego). Seldon is in love with and married to the gynoid Dors, who was initially assigned as his protector. When Dors is dying after 28 years of marriage, she tells her husband that thanks to him she felt like a human being. Newer movies also take up the issue: Examples are the Swedish TV series "Real Humans" representing humanoid robots that are exploited as sexual partners, and the movie "Ex Machina" in which the gynoid Ava expresses romantic interest in a man to manipulate him into helping her escape from the research lab.

In recent times, intimate human–robot relationships are increasingly covered by non-fictional media as well. Technological development—driven by the sex industry—has progressed so far that the first love and sex robots are marketed as advanced sex toys and sex dolls with artificial intelligence, respectively. For example, *Harmony* (Realbotix; https://realbotix.systems) can be customized concerning displayed traits and emotions, and *Roxxxy Gold* (TrueCompanion; www.truecompanion.com) has preprogramed personalities (e.g., Wild Wendy, Frigid Farah; for an overview see [5]). Media reports (e.g., press articles, TV news) portray such products, their features, and their users. For example, *Mirror Online* featured a report titled "Sex robot Harmony is the girlfriend of a million male fantasies—on sale for £11,700" on May 15th, 2017 [6], describing her human-like appearance, customizability, and the artificial intelligence system that is programmable with various personality traits.

In academic robot research, intimate human–robot relationships are investigated under the keyword *Lovotics* [7]. According to the authors, in the last years, "human–robot romantic and intimate relationships rapidly developed into an academic research discipline in its own right" (p. 835 [7]). Lovotics aims at achieving close relationships between humans and robots, and integrates core concepts from psychology, biology, neuroscience, and robotics. These concepts are used to develop a model that imitates the human affection process in order to create an emotionally engaging robotic system with a high level of intimacy [8]. These research activities are covered by non-fictional media. Also, the scientific congresses on "Love and Sex with Robots", which have been taking place in November 2014 and December 2016, were clearly reflected in the press. For example, *Express Online* titled "Sexual healing? Sex robots should be put in OLD PEOPLE'S homes, says expert" on December 21st, 2016. The article cites Kate Devlin, organizer of the "Love and Sex with Robots" congress in 2016, who suggests that sex robots could be used therapeutically (e.g., for widowed people to fulfill their desire for intimacy or for people who are unlikely to meet a human partner due to physical or learning disabilities).

Up to now, no systematic study has been conducted on how sexual and emotional intimate human–robot relationships are portrayed in the media. Therefore, this study aimed at analyzing such media representations to answer the research question how sex and love with robots are represented in fictional and non-fictional media today.

The relevance of the current study is based on the fact that most people today gain their knowledge about and their attitudes towards intimate human–robot relationships only from media coverage. Characteristics of media coverage influence public opinion. And public opinion in turn co-determines how love and sex robots—which are at the moment in a quite early development stage—will be developed further, which features they will have, how they will be marketed, how they will be regulated in legal terms, and how they will be evaluated and adopted by the public.

## 2 Theoretical Background and Research Questions

The theoretical framework of the current study is Sexual Script Theory [9]. Sexual scripts purport how intimate and sexual relationships of human beings are organized and arranged within a culture [10]. They serve as guidelines for intimate and sexual behavior [11]. A common script in the Western world for proceeding in intimate relationships is the established sequence of first, falling in love, second, getting engaged, and last, getting married. Sexual interactions are also determined by sexual scripts (e.g., start with kissing, proceed with foreplay, followed by sexual intercourse). Sexual scripts are communicated and displayed both in real-life interactions and in media representations [12].

Sexual scripts in the Western world are highly influenced by gender roles. Until today, traditional gender roles expect men to be more sex-oriented and women to be more relationship-oriented [13]. At the same time, according to traditional gender roles, the man is supposed to be the active part who makes the first move, while the woman is supposed to be the passive part waiting to be conquered.

Additionally, sexual scripts are strongly shaped by the notion that heterosexuality is the normal case, whereas homosexual relationships are less visible. This phenomenon is termed *heteronormativity* [14], defined as "the view that institutionalized heterosexuality constitutes the standard for legitimate and expected social and sexual relations" (p. 76; [15]).

Both, heteronormativity and traditional gender roles have been criticized by scholars as inappropriate and repressive in the light of the existing diversity of genders and sexualities (for overviews see [15–17]).

Analyzing media representations of intimate human–robot relationships based on Sexual Script Theory means to examine how such relationships are organized and which characteristics the involved human and robot partners have, explicitly including gender roles and sexual orientation.

We differentiated between fictional and non-fictional media for the analysis, because they follow different representation norms and production conditions: fictional media are unrestricted in their representations and not tied to the current status quo of technological development. In the context of the Science Fiction genre, fictional media can represent love and sex with robots in an utopian as well as a dystopian way, with all shades of grey in between, and they can attribute arbitrary abilities to robots. In contrast, non-fictional media representations correspond more to reality and relate to the current state of robot development and current societal conditions.

Against this backdrop we expected that love and sex with robots in non-fictional media representations would mostly stick to conventional sexual scripts, traditional gender roles, and heteronormativity, whereas fictional media representations would show more diversity.

The following three research questions guided the study:

RQ1: How is the typical *human* involved in intimate human–robot relationships represented in fictional and non-fictional media types?
RQ2: How is the typical *robot* involved in intimate human–robot relationships represented in fictional and non-fictional media types?
RQ3: What *characteristics* of the intimate human–robot relationships are represented in fictional and non-fictional media types?

## 3 Method

A quantitative media content analysis of non-fictional as well as fictional media representations of intimate human–robot relationships was conducted.

### 3.1 Sampling

A quota sample of $N = 710$ media examples from different genres (48% non-fictional, 52% fictional, originating from 1927 to 2014) was drawn in fall 2014. For fictional media, (a) fan fiction stories, (b) mangas and comics, and (c) movies and TV series were selected as media types. For non-fictional media, (a) newspaper and magazine articles and (b) informational videos on YouTube were chosen as media types. Thereby, textual, visual, and audiovisual media types that represented intimate human–robot relationships were covered (see Table 1). Further determinants for selection of those media types were that the material (1) was available in English language, (2) was accessible online free of charge, and (3) represented intimate human–robot relationships. Due to our extensive research we can put on record that all media types that meet these criteria are covered by our study.

For each selected media type a quorum of 50 media examples were researched that represented at least one emotional and/or sexual intimate human–robot relationship. We treated each complete media example (e.g., full newspaper/magazine article or full fan fiction story) as *unit of analysis*.

For researching relevant media examples from the selected media types, we used search term combinations of robot, android, gynoid etc. on one hand and sex, romance, love, dating, prostitute, boy-/girlfriend etc. on the other hand.

We identified fan fiction stories by Google search and specific fan fiction servers (e.g., www.fanfiction.net). Mangas and comics were also searched by Google search and specific manga portals (e.g., www.mangahere.co). Movies and TV series were identified by Google search and movie databases (e.g., Internet Movie Database IMDb: www.imdb.com). Newspaper and magazine articles in turn were researched by Google search and the database Nexis (www.nexis.com). Informational YouTube videos were identified by the YouTube search form (www.youtube.com). As we detected a large number of textual fictional (fan fiction stories) as well as textual non-fictional (newspaper and magazine articles) media representations of intimate human–robot relationships, we included more than 50 media examples of these media types in the sample. Non-fictional visual media examples (e.g., animations illustrating the current state of intimate human–robot relationships) could not be found, therefore this media type is not covered by the study.

**Table 1** Media genres, media types and respective absolute frequencies of media examples included in the sample

| Media type | Media genre | | Sum |
|---|---|---|---|
| | Non-fictional | Fictional | |
| Textual | Newspaper and magazine articles | Fan fiction stories | |
| | $n = 290$ | $n = 270$ | $n = 560$ |
| Visual | – | Mangas and comics | |
| | | $n = 50$ | $n = 50$ |
| Audiovisual | Informational YouTube videos | Movies and TV series | |
| | $n = 50$ | $n = 50$ | $n = 100$ |
| Sum | $n = 340$ | $n = 370$ | $N = 710$ |

## 3.2 Measurement of Variables

Corresponding to the three research questions presented in Sect. 2, the media representations were to be analyzed with regard to characteristics of the intimate human partner, the intimate robot partner, and the intimate human–robot relationship. The unit of coding was the main intimate human–robot relationship represented in the respective media example.

We developed a codebook that consisted of four blocks: in the first block, features of the analyzed media examples were recorded as formal categories (e.g., media type). In the further content-related blocks, characteristics of the human, the robot, and their mutual relationship were measured respectively. In total, 32 variables were assigned to the four blocks (see Table 2).

The content-related variables were derived from the theoretical background (see Sect. 2) and the current academic discourse [1, 5, 18, 19]. We explicitly included both, variables that represent heteronormative and traditional gender-role related aspects of human users (e.g., human is male; human is an adult), robots (e.g., robot is female; robot is an adult), and relationships (e.g., heterosexual relationship), as well as non-heteronormative and non-traditional gender-role characteristics (e.g., human is female/minor; robot is male/is a minor; homosexual relationship). Issues picked out in the academic discourse (e.g., human lacks social skills or personal attractiveness or has a disability; robot has the ability to have sex and/or robot has free will; human–robot-relationship is a sex work relationship or a committed love relationship; [1, 5, 20–25]) were also included in the codebook. All categories were coded as binary variables (0 = characteristic not presented, 1 = characteristic presented). Frequencies of all coded variables are given in Table 2.

## 3.3 Inter-coder Reliability

For each of the five media types, $n = 20$ media examples ($n = 100$ units of analysis in total) were randomly selected from the sample and coded by two independent coders in a pretest. As reliability coefficients, we computed Cohen's Kappa (which is corrected for chance agreement) and percent agreement for every variable (see Table 2). In general, good to very good reliability between 72 and 99% were shown for percent agreement. According to Neuendorf [26], percent agreement values > .70 are appropriate for exploratory studies and percent agreements > .80 are highly acceptable. Due to controlling for chance agreement, Cohen's Kappa coefficients show considerably lower values. As described by Hallgren [27], Kappa values between .40 and .67 can be considered as sufficient. On the basis of the results for reliability testing, the codebook on the whole can be regarded as sufficiently reliable.

## 3.4 Data Collection, Data Cleansing, and Data Analysis

Data collection took place in fall 2014 by 23 trained coders in the course of an online content analysis. Due to copyright reasons, the material was not copied but examined and coded online based on the archived online links. The procedure is uncritical concerning research ethics, because no copies or archives of the material were generated and only material that was available freely and publicly online was analyzed. All coders used the same electronic code sheet. The individual codings were aggregated into a collective file.

In the course of data cleansing, the collective data set was thoroughly checked. Every variable was subjected to descriptive frequency analysis in order to examine completeness of codes (no undetermined missing values), which were corrected after reviewing the respective media examples again. The same frequency analysis procedure was followed for identifying implausible codes outside of the regular code range (values that did not correspond to the preset variable labels of 0 = characteristic not presented, 1 = characteristic presented), which were also corrected after reassessing the media examples (e.g., value of 11 was corrected to 1).

Data analysis was performed with IBM SPSS 23, namely by descriptive statistics, exploratory statistical analyses, and inferential statistics:

- Individual characteristics of the human, the robot, and their reciprocal intimate relationships can be described by descriptive statistics as relative frequencies (percentages) by means of the measured binary variables (see Table 2). Differences between fictional and non-fictional media regarding these characteristics are presented in Table 3.

- As RQ1 addressed the typical human and RQ2 the typical robot involved in reciprocal intimate relationships, the statistical analyses needed to reveal typical combinations of human and robot characteristics. Hierarchical cluster analysis as an *exploratory multivariate statistical method* was used, as no a priori number of clusters could be determined theoretically. The Sørensen-Dice coefficient was chosen as a similarity measure, because it excludes negative matches (where both cases to be compared have an absence of the coded attribute). As Choi et al. [28] state, negative matches do not necessarily mean similarity between two objects, because an almost infinite number of attributes is possibly lacking in them. Further, the Sørensen-Dice coefficient weighs positive matches (both cases to be compared show the coded attribute) with a weight of 2. In our case, the positive matches were more relevant to our research questions than the negative matches. Average linkage between groups was chosen as the clustering method, as it performs similarly well when

**Table 2** Coding variables, inter-coder reliability of the pretest (Cohen's Kappa and percent agreement), and frequencies (in percent)

| Category | Cohen's Kappa (Pretest) | Percent agreement (Pretest) | Frequency (%) |
|---|---|---|---|
| *Formal categories* | | | |
| Media type | .98 | 99 | 100.0[a] |
|   Newspapers/magazines | | | 40.8 |
|   Online videos | | | 7.0 |
|   Movies/TV programs | | | 7.0 |
|   Fan fiction stories | | | 38.0 |
|   Comic books/mangas | | | 7.0 |
| *Human characteristics* | | | |
| Role | | | |
|   Human is owner of robot | .49 | 75 | 48.9 |
|   Human is creator of robot | .59 | 89 | 12.4 |
| Gender | | | |
|   Human is male | .77 | 91 | 53.5 |
|   Human is female | .75 | 88 | 35.9 |
| Age | | | |
|   Human is a minor | .90 | 96 | 15.2 |
|   Human is an adult (about 18–65) | .70 | 89 | 48.5 |
|   Human is a senior | .49 | 97 | 3.5 |
| Attributes | | | |
|   Human has mental health problems | .28 | 80 | 17.7 |
|   Human has physical problems/a disability | .66 | 98 | 4.8 |
|   Human lacks social skills | .19 | 86 | 10.3 |
|   Human lacks personal attractiveness | .38 | 96 | 3.2 |
| *Robot characteristics* | | | |
| Gender | | | |
|   Robot is male | .69 | 85 | 39.0 |
|   Robot is female | .74 | 87 | 46.8 |
| Age | | | |
|   Robot is a minor | .70 | 88 | 14.5 |
|   Robot is an adult | .74 | 89 | 48.5 |
| Appearance | | | |
|   Robot has humanoid appearance | .57 | 82 | 67.0 |
|   Robot has partly humanoid, partly mechanical appearance | .46 | 82 | 16.9 |
|   Robot has machine-like mechanical appearance | .56 | 90 | 9.9 |
| Attributes | | | |
|   Robot has free will | .66 | 83 | 40.1 |
|   Robot shows feelings | .43 | 75 | 62.7 |
|   Robot has feelings | .73 | 86 | 40.0 |
|   Robot has ability/functionality to have sex | .78 | 92 | 64.6 |
| *Human–robot-relationship characteristics* | | | |
| Sexual orientation | | | |
|   Heterosexual relationship | .74 | 91 | 60.4 |
|   Homosexual relationship | .85 | 96 | 13.9 |
|   Other sexual orientation relationship | –[b] | –[b] | 1.4 |
| Sexual intimacy | | | |
|   Casual sexual relationship | .60 | 80 | 45.9 |
|   Sex work/prostitution relationship | .60 | 88 | 20.8 |
| Emotional intimacy | | | |
|   Casual romantic/dating relationship | .17 | 72 | 22.8 |

**Table 2** (continued)

| Category | Cohen's Kappa (Pretest) | Percent agreement (Pretest) | Frequency (%) |
|---|---|---|---|
| Committed love relationship | .41 | 72 | 34.4 |
| Cohabitation | .70 | 87 | 29.3 |
| Formal relationship | | | |
| Engagement or marriage | .72 | 92 | 17.3 |
| Reproduction | | | |
| Reproduction of human and robot | .92 | 99 | 6.1 |

[a]The frequencies of the media types do not add up to 100% due to rounding errors

[b]No Cohen's Kappa computed, as pretest data were a constant

compared to the established Ward method [29]. The latter was not used, because it performs well if it is used with a distance measure (whereas the Sørensen-Dice coefficient is a similarity coefficient) and the Ward method is recommended for cluster analyses on variables with at least interval level of measurement [30]. The number of clusters was determined by means of the elbow criterion. According to Matthes and Kohring [31], this criterion is similar to the scree test in exploratory factor analysis. An elbow in the change of heterogeneity measures indicates that "fusing these two clusters would result in a cluster that is too heterogeneous" (p. 269, [31]). Differences between the clusters for non-fictional and fictional media are discussed descriptively as no test of statistical significance for this specific type of cluster comparison is available.

- In order to answer RQ3, a comparison on how the characteristics of the intimate human–robot relationship are represented in fictional versus non-fictional media was needed. Two-dimensional Chi-square tests were computed for this inferential statistical comparison.

# 4 Results

In the following section, we present the findings for the three research questions separately, and compare them for non-fictional and fictional media.

## 4.1 Characteristics of the Intimate Human Partner

### 4.1.1 Representation of the Typical Intimate Human Partner in Non-fictional Media

The cluster analysis of the typical human represented in non-fictional media (RQ1) revealed a five cluster solution. The typical human partner (cluster 1) in intimate human–robot relationships can be described as an adult user (about 18–65 years old) who owns the robot and is disadvantaged in interpersonal relationships due to mental health problems and lack of social

skills. Further, male gender seemed to be relevant, as it was the first variable to be fused in a cluster. This representation of the human user is in line with the current public discourse assuming that 'creepy' male adult users resort to robots to overcome their loneliness [1, 5].

However, there are other user groups: people who create a robot partner (creators; cluster 2), who are minors or seniors (which represents the other age groups of human users; cluster 3), users with physical health problems or disabilities (physically-disadvantaged users, cluster 4), and users who lack personal attractiveness (unattractive users; cluster 5). The cluster solutions for the typical human represented in non-fictional media are presented in Fig. 1.

### 4.1.2 Representation of the Typical Intimate Human Partner in Fictional Media

The analysis for the typical human represented in fictional media (RQ1) revealed a four cluster solution. In these media representations, the typical human partner (cluster 1) can be described as an adult or a minor who owns or creates the robot. Again, male gender was the first variable to be fused in a cluster. The human is disadvantaged in interpersonal relationships due to his or her mental health problems and lack of social skills. Although this representation is also rather heteronormative and in line with traditional gender roles, women and minors were also included, showing slightly more diversity among humans involved in intimate human–robot relationships. The remaining clusters represent additional groups: seniors (cluster 2), physically disadvantaged humans (cluster 3), and unattractive humans (cluster 4). The cluster solutions are presented in Fig. 2.

### 4.1.3 Comparison of Non-fictional and Fictional Media Representations of the Typical Intimate Human Partner
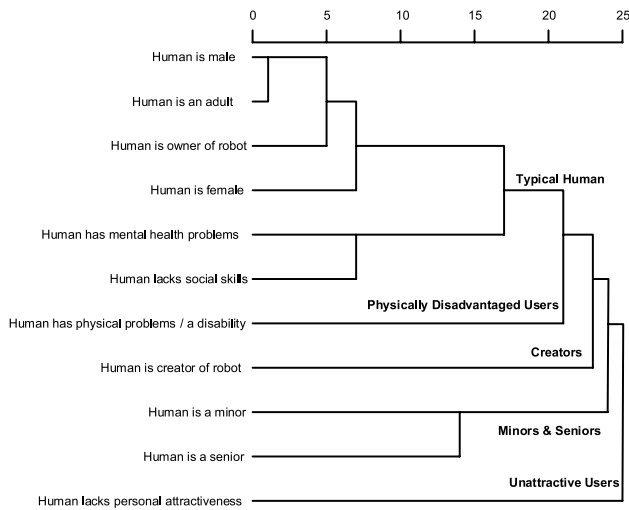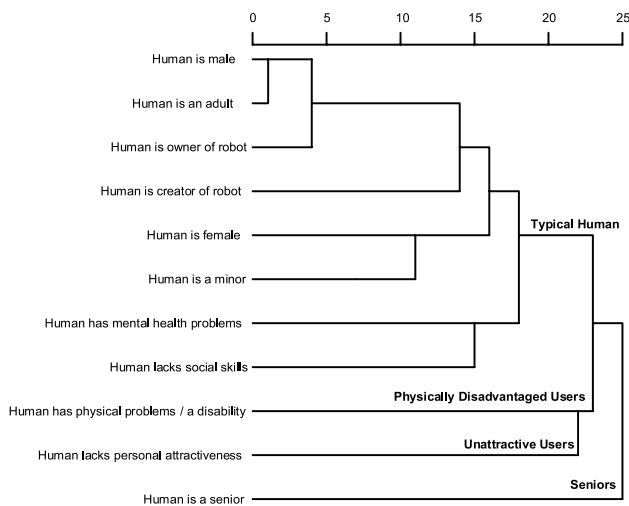
The clusters for the typical intimate human partner represented in non-fictional and fictional media were quite similar. However, fictional media showed more variety for the

**Table 3** Characteristics of humans, robots, and intimate human–robot relationships represented in non-fictional (*n* = 340) versus fictional (*n* = 370) media examples

| Category | Non-fictional media | | Fictional media | | $\chi^2(1)$ | *p* | Cramer's *V* |
|---|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | | | |
| *Human characteristics* | | | | | | | |
| Role | | | | | | | |
|   Human is owner of robot | 175 | 52 | 172 | 47 | 1.76 | .184 | .050 |
|   Human is creator of robot | 22 | 7 | 66 | 18 | 21.09 | <.001 | .172 |
| Gender | | | | | | | |
|   Human is male | 152 | 45 | 228 | 62 | 20.38 | <.001 | .169 |
|   Human is female | 96 | 28 | 159 | 43 | 16.72 | <.001 | .153 |
| Age | | | | | | | |
|   Human is a minor | 7 | 2 | 101 | 27 | 87.51 | <.001 | .351 |
|   Human is an adult (about 18–65) | 133 | 39 | 211 | 57 | 22.75 | <.001 | .179 |
|   Human is a senior | 17 | 5 | 8 | 2 | 4.20 | .040 | .077 |
| Attributes | | | | | | | |
|   Human has mental health problems | 61 | 18 | 65 | 18 | .02 | .896 | .005 |
|   Human has physical problems/a disability | 17 | 5 | 17 | 5 | .06 | .800 | .009 |
|   Human lacks social skills | 45 | 13 | 28 | 7 | 6.17 | .013 | .093 |
|   Human lacks personal attractiveness | 10 | 3 | 13 | 4 | .19 | .667 | .016 |
| *Robot characteristics* | | | | | | | |
| Gender | | | | | | | |
|   Robot is male | 72 | 21 | 205 | 55 | 87.25 | <.001 | .351 |
|   Robot is female | 161 | 47 | 171 | 46 | .09 | .762 | .011 |
| Age | | | | | | | |
|   Robot is a minor | 18 | 5 | 85 | 23 | 44.65 | <.001 | .251 |
|   Robot is an adult | 142 | 42 | 202 | 55 | 11.68 | .001 | .128 |
| Appearance | | | | | | | |
|   Robot has humanoid appearance | 206 | 61 | 270 | 73 | 12.30 | <.001 | .132 |
|   Robot has partly humanoid, partly mechanical appearance | 55 | 16 | 65 | 18 | .24 | .621 | .019 |
|   Robot has machine-like mechanical appearance | 42 | 12 | 28 | 7 | 4.57 | .033 | .080 |
| Attributes | | | | | | | |
|   Robot has free will | 26 | 8 | 259 | 70 | 286.69 | <.001 | .635 |
|   Robot shows feelings | 151 | 44 | 294 | 80 | 93.04 | <.001 | .362 |
|   Robot has feelings | 32 | 9 | 252 | 68 | 254.35 | <.001 | .599 |
|   Robot has ability/functionality to have sex | 273 | 80 | 186 | 50 | 69.89 | <.001 | .314 |
| *Human–Robot-relationship characteristics* | | | | | | | |
| Sexual orientation | | | | | | | |
|   Heterosexual relationship | 140 | 41 | 289 | 78 | 101.06 | <.001 | .377 |
|   Homosexual relationship | 21 | 6 | 78 | 21 | 32.80 | <.001 | .215 |
|   Other sexual orientation relationship | 5 | 2 | 5 | 1 | .02 | .893 | .005 |
| Sexual intimacy | | | | | | | |
|   Casual sexual relationship | 206 | 61 | 120 | 32 | 56.56 | <.001 | .282 |
|   Sex work/prostitution relationship | 111 | 33 | 37 | 10 | 55.08 | <.001 | .279 |
| Emotional intimacy | | | | | | | |
|   Casual romantic/dating relationship | 74 | 22 | 88 | 24 | .41 | .522 | .024 |
|   Committed love relationship | 109 | 32 | 135 | 37 | 1.54 | .215 | .047 |
|   Cohabitation | 77 | 23 | 131 | 35 | 13.92 | <.001 | .140 |
| Formal relationship | | | | | | | |
|   Engagement or marriage | 81 | 24 | 42 | 11 | 19.24 | <.001 | .165 |

**Table 3** (continued)

| Category | Non-fictional media | | Fictional media | | $\chi^2(1)$ | p | Cramer's V |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | | | |
| Reproduction | | | | | | | |
| Reproduction of human and robot | 8 | 2 | 35 | 10 | 15.73 | < .001 | .149 |



**Fig. 1** Dendrogram for representation of the typical intimate human partner in non-fictional media based on the results of a hierarchical cluster analysis ($n = 340$ media examples)



**Fig. 2** Dendrogram for representation of the typical intimate human partner in fictional media based on the results of a hierarchical cluster analysis ($n = 370$ media examples)

typical human. There are fan fictions stories, for example, where the main character is a lonely male teenager, who creates his own female robot as a companion and they run away

from home together. Creating robots in real life is a difficult, scientific, and expensive process. To date, very few people have the ability and the means to create robots. These limitations are not relevant for the representation of human–robot relationships in fictional media.

### 4.2 Characteristics of the Intimate Robot Partner

#### 4.2.1 Representation of the Typical Intimate Robot Partner in Non-fictional Media

The analysis for the typical robot represented in non-fictional media (RQ2) revealed a four cluster solution. The typical robot partner in intimate human–robot relationships is represented as a stereotypical sex robot (cluster 1). It can be either male or female, although female gender is fused into a cluster at a considerably earlier stage than male gender. Further, it is an adult and has a humanoid appearance. The robot also has the ability to have sex and show feelings. Supplemented with the typical human represented in non-fictional media, this creates a heteronormative picture that is in line with traditional gender roles: humanoid female robots serve as sex objects for heterosexual male humans.

Other types of robots, however, are also represented. These include: child robots (cluster 2) and non-humanoid robots (which have a partly humanoid, partly mechanical appearance or a purely machine-like appearance; cluster 3), as well as a type of robot that can be described as a sentient being (cluster 4). These robots not only have feelings, but also have free will. The cluster solutions for the typical robot represented in non-fictional media are presented in Fig. 3.

#### 4.2.2 Representation of the Typical Intimate Robot Partner in Fictional Media

The analysis for the typical intimate robot partner represented in fictional media (RQ2) revealed a four cluster solution. Fictional media represented the typical robot partner as an adult sex robot with a humanoid appearance and the ability to have sex. Interestingly, gender (male and female) were fused into the cluster rather late. Further, those robots not only show and experience feelings, but also have free will, which seemed to be the most important variables for the cluster process. These robots can therefore be considered
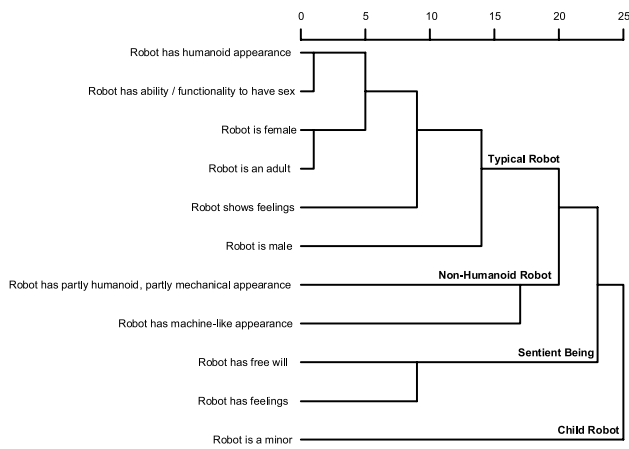
**Fig. 3** Dendrogram for representation of the typical intimate robot partner in non-fictional media based on the results of a hierarchical cluster analysis ($n = 340$ media examples)
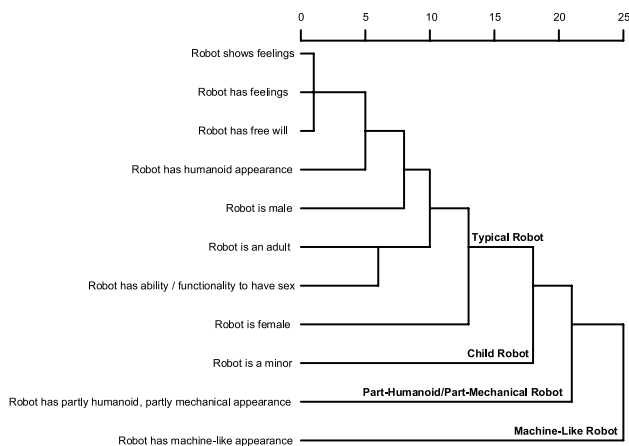


**Fig. 4** Dendrogram for representation of the typical intimate robot partner in fictional media based on the results of a hierarchical cluster analysis ($n = 370$ media examples)

foremost as sentient beings (cluster 1). This image of a typical robot for intimate human–robot relationships clearly transcends the representation of the typical robot in non-fictional media, and even questions heteronormativity and traditional gender roles: Robots of either gender are not only sex objects, but as sentient beings even sex subjects. Gender seemed to be less important than emotional capacities and intelligence of the robots. Other types or robots are, once again, child robots (cluster 2) and non-humanoid robots (with partly humanoid/partly mechanical appearance, cluster 3; and with a machine-like mechanical appearance, cluster 4). The cluster solutions for the typical robot represented in fictional media are shown in Fig. 4.

### 4.2.3 Comparison of Non-fictional and Fictional Media Representations of the Typical Intimate Robot Partner

Although the clusters for the typical intimate robot partner represented in non-fictional and fictional media were fairly similar overall, some interesting distinctions appeared: First, for non-fictional media, female robot gender seemed to be more relevant than male robot gender. Therefore, non-fictional media often represented the stereotypical female sex robot that served as a sexual object for the male user. Several newspaper articles and YouTube videos address the appearance and sexual functionality of female sex robots, which are intended for private use by men and for robot brothels. This finding is compliant to traditional gender roles and a heteronormative understanding of sexuality.

In fictional media, though, robot gender seemed to be less important than variables that represented sentient beings (e.g., having and showing feelings as well as having a free will). Fictional media can envision robots and human–robot relationships that go beyond the current state of research and development, and they seem to address more diversity in human–robot intimacy that do not necessarily adhere to established traditional gender roles in a heteronormative context. For example, the popular Hollywood movie *A.I.* features a male robot who acts as a „gigolo".

### 4.3 Characteristics of the Intimate Human–Robot Relationship

#### 4.3.1 Characteristics of the Intimate Human–Robot Relationship in Non-fictional Media

To answer research question 3 what *characteristics* of intimate human–robot relationships are represented in fictional and non-fictional media types, the last section of Table 3 shows the frequencies of relationship characteristics. Non-fictional media showed a higher percentage of representing heterosexual relationships (41%) than homosexual relationships (6%).

Aspects covering sexual intimacy were also more often represented in non-fictional media, especially casual sex and sex work relationships (representing sexual encounters without emotional commitment). This is not surprising: casual sex and sex work are application contexts of sex robots that are often envisioned and a plausibility for the near future [1, 7, 20]. Emotional intimacy relationship characteristics were represented with lower frequencies. Apparently, non-fictional media touch these aspects, but focus more on sexual intimacy, which would probably be easier to implement.

### 4.3.2 Characteristics of the Intimate Human–Robot Relationship in Fictional Media

The sexual orientation of the human–robot relationship was often explicitly addressed in fictional media, with a higher percentage of heterosexual relationships (see the last section of Table 3). However, homosexual relationships were presented in more than a fifth (21%) of the media examples in the sample. Interestingly, fictional media seemed to focus more on private, not professional (e.g., sex work/prostitution) relationships. Emotionally intimate relationship characteristics were slightly more often represented than sexual intimacy characteristics. Even cohabitation (35%) and reproduction of humans and robots (10%) were represented in fictional media examples. These characteristics could be seen as aspects that reflect a strong commitment and emotional tie between the human and robot partners.

### 4.3.3 Comparison of Non-fictional and Fictional Media Representations of Intimate Human–Robot Relationships

Concerning characteristics of intimate human–robot relationships, within non-fictional media there seemed to be a focus primarily on heterosexual relationships (41% vs. 6%; ratio 7:1), whereas within fictional media there existed an additional representation of homosexual relationships (78% vs. 21%; ratio 4:1) to a considerable degree (see the last section of Table 3). On the one hand, aspects covering sexual intimacy were significantly more often represented in non-fictional media (with a medium effect size). On the other hand, emotional intimacy relationship characteristics were represented in both media genres, but slightly more often in fictional media. Casual romantic and committed love relationships showed a nearly equal distribution across the media genres. However, cohabitation and reproduction of humans and robots (implying stronger commitment and emotional ties) were more often represented in fictional media (with a small effect size). In line with the findings from the cluster analysis of the typical robot representation in fictional media (robots as sentient beings) the establishment of love relationships between humans and robots in fictional media is a logical consequence. Interestingly, formalizing the relationship between humans and robots (in sense of engagement or even marriage) was more often an issue in non-fictional media (with a small effect size).

## 5 Discussion

In recent years, love and sex with robots have been widely debated, in academic and public discourses alike. Opinions are divided [32], including both positive attitudes (e.g., sex and love robots are a great solution to societal problems like prostitution or loneliness, [33, 34]) and negative attitudes (e.g., sex and love robots are a big danger for society, fostering women's objectification by men and creating loneliness when human partners are replaced by robotic partners, [35]). Given the lack of first-hand experience with love and sex robots in the broad population, people gain their knowledge from media representations. Therefore, the image of intimate human–robot relationships presented in both fictional and non-fictional media can have far-reaching consequences and shape public opinion, decision-making and technological development. On the basis of Sexual Script Theory [10], the current quantitative media content analysis aimed at exploring how emotionally and sexually intimate human–robot relationships are presented in non-fictional and fictional media.

Concerning *non-fictional media*, cluster analysis revealed a *typical* human partner who is an adult, owner of the robot and disadvantaged in human–human relationships due mental health problems and lack of social skills. The *typical* robot involved in intimate human–robot relationship was represented as a stereotypical sex robot. It has either gender with a tendency to be female, is an adult, has a humanoid appearance, sexual functionality and shows feelings. The combination of female robots and male human users in non-fictional media hints to the objectification of women that several researchers fear and also campaign against [35]. It also reflects traditional gender roles (men but not women being represented as sex subjects pursuing sexual pleasure with robots) and heteronormativity. Non-fictional media also cover the ethically charged issue of child robots used by pedosexual men [5]. Concerning relationship characteristics, non-fictional media focus on heterosexual relationships [5]. Casual sex and sex work (sexual intimacy aspects of relationships without commitment) are often envisioned for the near future [1, 18, 19, 23], but emotional intimacy relationship characteristics are also an issue to a lesser degree. Interestingly, formal relationships like engagement or marriage are a topic in non-fictional media representation, probably because both phenomena have been predicted by prominent and often cited academic advocates of love and sex with robots (e.g., [1, 7]).

With regard to *fictional media*, findings differed from non-fictional media in interesting ways. The typical human represented in fictional media was very similar to the human represented in non-fictional media, but showed more variety: even robot creators and minors (adolescents) are included in the typical human cluster. Further, the *typical robot* represented in fictional media goes beyond representations in non-fictional media. Here, the robots can be regarded as sentient beings. Besides the attributes that define a robot as a sex robot (e.g., functionality to

have sex), these robots experience feelings and have a free will. These attributes seemed to be even more important than robot gender. With regard to relationship characteristics, fictional media drew a wider picture than non-fictional media: Portraying the robot partner in an intimate human–robot relationship as a sentient being with free will allows for more emotional intimacy: Fictional media include cohabitation and even reproduction between humans and robots more often. Homosexual relationships were also more visible in fictional media, especially in fan fiction stories and mangas. This can be explained by the fact that several manga genres (e.g., Yuri, Shonen Ai, Yaoi) specifically deal with homosexual relationships [36].

Our findings revealed that sexual scripts, traditional gender roles and heteronormativity clearly shape media representations of love and sex with robots. We could further show that representations in non-fictional and fictional media differ according to expectations, in particular because they have different levels of correspondence to reality.

Additionally, this study revealed that production conditions within the media genres have a distinct influence. Fan fictions stories and mangas are more often produced by and/or for adolescent audiences [36] and therefore broach the issue of adolescent robot users and same-aged adolescent robots—a topic that is missing in non-fictional media coverage. These in turn discuss underage robots in terms of sexual abuse and pedosexual behavior. Further, it should be considered that user-generated content (e.g., fan fiction stories) is produced by a large diversity of authors, including not only adolescents, but also women, homosexual individuals, and so on. This is reflected in the diversity of media representations of intimate human–robot relationships.

Overall, media representations of love and sex with robots cover opportunities as well as challenges. Ethical questions are raised. Non-fictional media expound the problems of pedosexual abuse of child robots. In contrast, fictional media address the status of intimate human–robot relationships: Are they real "love relationships", are they accepted by society? Future studies could in particular deal with such ethical questions, such as they are discussed in the academic discourse [21, 22] and have reached the public by means of media representations.

Some limitations of the study need to be addressed. The conducted media content analysis covered a limited amount of variables related to intimate human–robot relationships. Further studies should cover a broader spectrum of categories, e.g. covering personality attributes of human and robot partners, more details about the relationship formation and maintenance phase, and also reactions of the social environment: how do friends and family react if someone leads an intimate relationship with a robot? Further, the material included in the analyses is not representative [37]. Drawing a representative sample of media examples was not possible.

Additionally, a content analysis by definition focuses on attributes of the media content itself [38]. We therefore cannot provide information about the media users, the media reception processes, or subsequent media effects.

Despite the above mentioned limitations, this study draws strength from the fact that we were able to draw a quota sample of $N = 710$ media examples representing intimate human–robot relationships from both non-fictional (e.g., newspaper/magazine articles, and online videos) and fictional media (e.g., fan fiction stories, comic/mangas and movies/TV series). We therefore covered a wide area of mass media and user-generated media content. Moreover, this study is one of the first to systematically examine media representations of love and sex with robots. Finally, having operated on the basis of Sexual Script Theory, this study provides insights into the patterns of how intimate human–robot relationships and the characteristics of their protagonists are displayed in the media, indicating which sexual scripts are prone to shape society's response to this topic.

## 6 Conclusion

Given the current state and dynamic of technological development, the production and diffusion of love and sex robots seem to be unavoidable in the near future. At the same time, academic and public discourses around sex and love with robots will remain controversial, especially due to lack of empirical data on intimate human–robot relationships [5]. Systematic empirical studies on risks and opportunities as well as attitudes towards love and sex with robots are mostly missing, with a few notable exceptions [18, 19]. Therefore, further studies are needed that, firstly, analyze how media users perceive media representations of love and sex with robots and which media effects they create. Second, studies should investigate potential users' attitudes and expectations regarding intimate human–robot relationships. How do culture, religion, age, or affinity for technology affect attitudes towards love and sex with robots? How do media representations focusing more on risks or on opportunities, on male or on female robot users, on adult or on adolescent robot users, on able-bodied or disabled robot users, on hetero- or on homosexual human–robot relationships influence people's attitudes toward sex and love with robots? Lastly, we need to explore the potential and actual effects of sexual and emotional intimacy with robots on individual users and society at large.

The findings of the current study have several implications for scholars and robot developers alike. Although media tend to draw a heteronormative and clichéd picture of intimate human–robot relationships, a wider variety of relationships (ranging from casual sex to marriage) is also noticeable, especially in fictional media. It seems

commendable for academics as well as robot developers to question heteronormative assumptions portrayed in non-fictional media and get inspired by the diversity of intimate human–robot relationships represented in fictional media. The *Positive Sexuality Framework* [39] and the *Positive Technology Framework* [40] could serve as a basis for future research and development. Both frameworks stem from the *Positive Psychology Approach* [41]. The Positive Sexuality Framework and the Positive Technology Framework emphasize that many discourses about sexuality (especially concerning the use of technological artifacts, e.g., robots) are shaped by implicit or explicit sex-negative beliefs and therefore need to be complemented by a focus on sexual pleasure, freedom, and diversity [39]. Researching and developing love and sex robots against this background does not mean to glorify or advertise them [32]. It encourages a responsible and theoretically well-grounded design and development of robots that ultimately serve human well-being, including social and sexual health in a future robotic age.

## Compliance with Ethical Standards

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