Article

Review of General Psychology
2023, Vol. 27(1) 26–40

DOI: 10.1177/10892680221105663
journals.sagepub.com/home/rgp


The Psychology of Personalization in Digital Environments: From Motivation to Well-Being – A Theoretical Integration

Fabian Hutmacher[1] and **Markus Appel**[1]

Abstract

The personalization of digital environments is becoming ubiquitous due to the rise of AI-based algorithms and recommender systems. Arguably, this technological development has far-reaching consequences for individuals and societies alike. In this article, we propose a psychological model of the effects of personalization in digital environments, which connects personalization with motivational tendencies, psychological needs, and well-being. Based on the model, we review studies from three areas of application—news feeds and websites, music streaming, and online dating—to explain both the positive and the negative effects of personalization on individuals. We conclude that personalization can lead to desirable outcomes such as reducing choice overload. However, personalized digital environments without transparency and without the option for users to play an active role in the personalization process potentially pose a danger to human well-being. Design recommendations as well as avenues for future research that follow from these conclusions are being discussed.

Keywords

personalization, artificial intelligence, recommender systems, self-determination, motivation, needs, well-being

The impact of digital media on individuals and societies is one of the key issues of our times. Some have argued that the rise of digital media has reduced individuals' well-being, leading to an increase in depressive symptoms and suicides (e.g., Twenge, 2019; Twenge et al., 2018), whereas others have questioned the evidence for this causal link (e.g., Appel et al., 2020; Granic et al., 2020; Orben & Przybylski, 2019). Against this background, and with digital platforms increasingly relying on artificial intelligence (AI) to boost user engagement and company revenues, it has become pivotal to understand the antecedents and processes underlying beneficial or maladaptive digital media use. Our focus here is on the personalization of experiences in the digital realm and its influence on the individual. We present a model based on Self-Determination Theory (SDT) that explains and predicts need satisfaction and well-being in personalized digital environments. This model is applied to reconstruct extant scientific evidence on personalization experiences in three fields: news feeds and websites, music streaming, and online dating. We discuss how our model could be used to improve human well-being in AI-based personalized environments.

The Personalization of Digital Environments

Digital environments can broadly be described as spaces and contexts created by electronic and digital technologies that we use for communicative, industrial, commercial, and recreational purposes (Buongiorno, 2021). The personalization of these environments is becoming ubiquitous, thanks to the rise of AI-based algorithms and recommender systems (e.g., Burr & Floridi, 2020; Sundar, 2020). By analyzing user data, news feeds and websites filter their content, search engines adjust which results to display, companies tailor ads to their customers, dating platforms suggest potential matches, music streaming services are able to recommend albums and artists, health service providers show different patients different information, and online learning environments adapt to the learners' progress and interests—to name just a few examples. In contrast to user-initiated customization, *personalization* refers to system-initiated processes (Sundar & Marathe, 2010; see also Fan & Poole, 2006; Arora et al., 2008). That is, personalization is not about the user making deliberate decisions regarding the kind of content that is displayed; it is about all those "automatic changes [that are

[1]Human-Computer-Media Institute, University of Würzburg, Würzburg, Germany

Corresponding Author:
Fabian Hutmacher, Human-Computer-Media Institute, University of Würzburg, Oswald-Külpe-Weg 82, 97074 Würzburg, Germany.
Email: fabian.hutmacher@uni-wuerzburg.de

made to digital environments] to accommodate individual user's need, interests, knowledge, goals, or tasks" (Serino et al., 2005, p. 1).

This kind of automatic, system-initiated, and algorithm-driven adaptation of digital environments is something fundamentally new: While people have always decided to focus on some aspects of their environment while neglecting others, the environment has remained essentially the same for everyone. However, personalization changes the environment itself: The virtual world is different for each individual—and it constantly changes in different ways for different individuals. For instance, the reader of a printed newspaper may skip certain articles, but the skipped articles remain a visible part of the environment. On a personalized news website, an algorithm can potentially filter out the articles the reader would likely skip before the reader even gets to see them. Arguably, this technological development has far-reaching consequences not only for human–computer interactions, but also for psychological well-being and ultimately for society in general. But is personalization a good or a bad thing?

This question can be answered from a wide range of different perspectives. For instance, the fact that personalization relies on collecting an abundance of personal data has raised ethical and legal concerns regarding privacy, trust, and discrimination (e.g., Bozdag, 2013; Burr et al., 2018; Fast & Jago, 2020; Matz et al., 2020; Milano et al., 2020; Mittelstadt et al., 2016; Taddeo & Floridi, 2018). Here, we are mainly concerned with understanding the impact of personalization on individuals. In this context, some argue that personalization enhances human agency by supporting better decision-making and reducing information overload, and that it may ultimately increase the individual's well-being (e.g., by fostering healthier lifestyles and lifelong learning; Spanakis et al., 2014). Others contend that personalization excludes human supervision, potentially enabling coercion, manipulation, and the formation of echo chambers as well as undermining autonomy and control (e.g., Mejtoft et al., 2020; Newell & Marabelli, 2015). Against this background, it seems reasonable to hypothesize that users differ regarding the perceived benefits and risks of personalization (see, e.g., Amarnath & Jaidev, 2020; Lee & Lee, 2009; Liang et al., 2006; Salonen & Karjaluoto, 2016; Treiblmaier & Pollach, 2007) and that personalization is likely to have complex influences on individuals.

In this paper, we propose a psychological model of the effects of personalization, one that considers individual motivational differences and that can explain both the positive and the negative effects of personalization. By integrating a wide range of findings from both inside and outside psychology, the model also provides a useful starting point for organizing future research. Our model is based on Self-Determination Theory (SDT; Deci & Ryan, 2000), an established model of psychological needs. This has a crucial advantage of allowing us to identify the psychological impact of personalization in digital environments, a novel phenomenon, by building on a strong foundation of knowledge regarding basic psychological needs. Focusing on the psychological processes addressed by SDT also enables us to base our analysis on mechanisms and individual differences that are deeply rooted within the human psyche. In other words, we decided to analyze personalization within a well-established framework designed to capture a wide range of human behavior, rather than outlining a model that can be used exclusively to explain the effects of personalization: This allows us to describe the impact of personalization using known terms and concepts but also to state explicitly what distinguishes personalization from other mechanisms shaping our environment. In this context, note that SDT has already been used to tackle the topic of well-being in human–computer interactions in general (e.g., the METUX model proposed by Peters et al., 2018). Although such broad conceptualizations provide a valuable starting point for further investigations, our model, which focuses specifically on personalization processes, allows for a more nuanced and detailed analysis of a phenomenon that drives many of the contemporary changes in the digital realm.

The Model: Motivation, Basic Psychological Needs, and Well-Being

Self-Determination Theory is a macro theory of human motivation, which connects motivational tendencies with innate psychological needs and well-being (for an overview, see, e.g., Deci & Ryan, 2000; 2008; Ryan & Deci, 2017). As far as motivation is concerned, SDT assumes that "the type or quality of a person's motivation [is] more important than the total amount of motivation" (Deci & Ryan, 2008, p. 182) and proposes an *autonomy-control continuum*. If a behavior is *autonomously* motivated, the person experiences volition and identifies with the behavior's value. The paradigmatic example for autonomous motivation is intrinsically motivated behavior, which is pursued without the necessity of specific consequences, that is, behavior that is interesting and pleasurable in and of itself. In contrast, behavior is *controlled* when it is regulated by external contingencies (i.e., when behavior is aimed at gaining a reward or avoiding a punishment) or when it "is energized by factors such as an approval motive, avoidance of shame, contingent self-esteem, and ego-involvements" (Deci & Ryan, 2008, p. 182). Put differently, controlled motivation comprises those forms of extrinsically motivated behavior that aim at obtaining some instrumentally separable consequence. When extrinsically motivated behavior is perceived as personally important, however, it will be experienced as relatively autonomous. Finally, a complete lack of self-determination and intention is

called *amotivation*. When being amotivated, people feel unable to attain desired outcomes and experience a lack of interest and relevance, sometimes accompanied by feelings of helplessness (see, e.g., Pelletier et al., 1999).

While the degree to which behavior is autonomous or controlled may vary from context to context (i.e., is state-dependent), SDT also proposes that there are relatively stable individual differences in the form of *causality orientations* (see Deci & Ryan, 1985). The three causality orientations—the autonomy orientation, the controlled orientation, and the impersonal orientation—"parallel at a more global level the concepts of autonomous motivation, controlled motivation, and amotivation" (Ryan & Deci, 2017, p. 20). While an *autonomy orientation* mirrors the general tendency to take one's own values and interests as a guideline when organizing behavior, a *controlled orientation* is the general tendency to adjust one's behavior based on expected reward contingencies and social controls. In addition, if one generally experiences feelings of incompetence and a lack of control over one's environment, one has an *impersonal causality orientation*.

Crucially, motivation is linked to the three innate psychological needs for autonomy, competence, and relatedness. Autonomy denotes the need "to self-organize and regulate one's own behavior," while competence refers to the need "to engage optimal challenges and experience mastery or effectance in the physical and social worlds," and relatedness is the need "to seek attachments and experience feelings of security, belongingness, and intimacy with others" (Deci & Ryan, 2000, p. 252). As far as the link between motivation and need satisfaction is concerned, autonomously motivated behavior is more likely to result in a satisfaction of all three basic needs than controlled behavior. Moreover, the satisfaction of the three psychological needs leads to well-being. Note in this context that the term well-being can refer to two different concepts: *hedonic* and *eudaimonic well-being* (e.g., Ryan & Deci, 2001). Hedonic well-being is achieved when pleasure is maximized and pain is minimized, while eudaimonic well-being denotes the full functioning of the individual. SDT is mainly concerned with eudaimonic well-being and states that people experience eudaimonic well-being when they achieve their potential and have the opportunity for personal growth as indicated by a satisfaction of their basic needs. Reversely, need thwarting is associated with less than optimal development and functioning, potentially causing psychological and physical health problems (see, e.g., Ryan et al., 2006). Note also that need frustration and reduced well-being predict motivational depletion (Ryan & Deci, 2008), that is, need frustration and reduced well-being make it less likely that a person shows autonomously motivated behavior, potentially creating a vicious circle.

According to our model, the main components of SDT can be taken as a basis for analyzing the impact of personalization in digital environments from the perspective of the individual (see Figure 1). The effects of personalization on a user with a *controlled motivation* will crucially depend on whether the personalized recommendations help the user to attain the desired goal (e.g., finding the information on a website that one is looking for). However, when considering individuals with *autonomous motivation*, that is, individuals whose interest is not primarily in achieving an instrumental goal but who identify with their behavior's value and for whom the behavior is interesting and pleasurable in and of itself, matters become more complex. Following SDT, we assume that the impact of personalization on autonomously motivated individuals mainly depends on how it affects the current experience. Hence, autonomously motivated individuals may

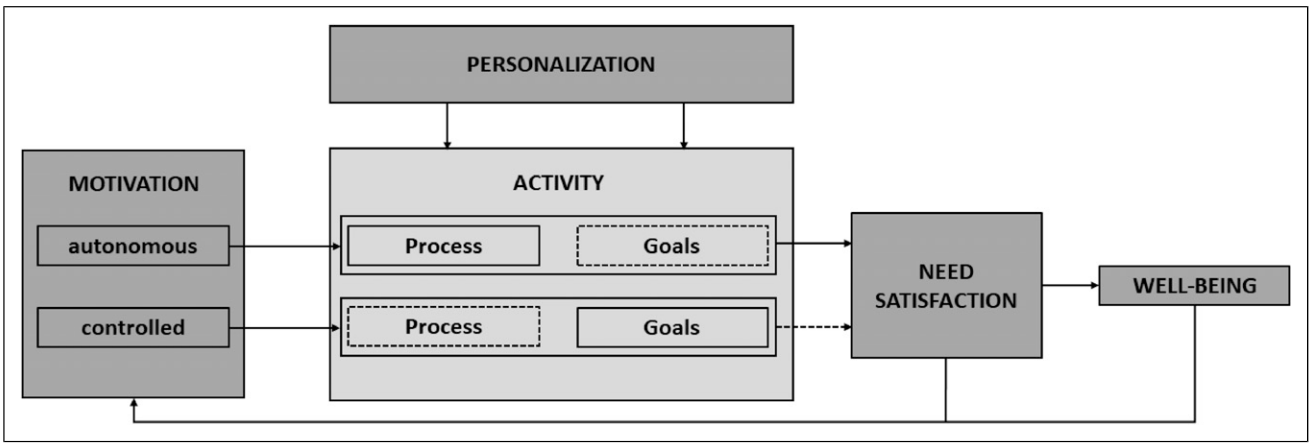

Figure 1. Illustration of the model.

Note. Motivation influences what individuals focus on when engaging in a specific activity such as navigating through a digital environment. Individuals with a controlled motivation are mainly interested in achieving a particular goal, while autonomously motivated individuals put more emphasis on the process of engaging in the activity. As personalization influences both the process of engaging in an activity and the attainment of goals associated with the activity, the operating characteristics of a personalization algorithm can ultimately affect the satisfaction of the basic psychological needs and well-being.

perceive personalization as helpful insofar as it reduces information overload and filters out irrelevant options. However, they may also perceive personalization as intrusive and limiting insofar as it disrupts engagement with the activity.

Especially the latter considerations regarding autonomously motivated individuals seem to suggest that personalization in digital environments can ultimately have both positive and negative influences on the satisfaction of our basic needs for autonomy, competence, and relatedness. For instance, being freed from irrelevant options may help foster autonomy and competence as it enables users to focus on those aspects that they find interesting and engaging when navigating through a digital environment. At the same time, not knowing which options are being filtered out and for what reasons, may undermine this effect, potentially leading to need frustration and reactance (Brehm, 1966; Brehm & Brehm, 1981). With respect to relatedness, personalization could help to create common environments for individuals with common interests. At the same time, being restricted to one's personalized environment may also disrupt social interactions, as there are fewer shared experiences with other individuals who do not have the same interests. Ultimately, this could also have effects on well-being. As one may argue, a well-designed personalization algorithm, which is able to capture the individual's interests and goals and to recommend content that fits these interests and goals, will help to achieve hedonic well-being. Achieving eudaimonic well-being, however, requires more than good recommendations that work as gratifications: It requires respecting the needs for autonomy, competence, and relatedness. These considerations add a normative dimension to our model: If personalization in digital environments is neither a good nor a bad thing per se, but has distinct effects not only on user experience, but also on the individual's well-being, it seems desirable to design personalized environments and recommender systems in a way that supports the satisfaction of our basic psychological needs (see, e.g., Calvo et al., 2020; Peters et al., 2018). Before discussing these implications, we will review findings from three areas of application—news feeds and websites, music streaming, and online dating—based on the model that we have just described.

Personalization of News Feeds and Websites

Most information that we have about the world is not based on direct, personal experience, but rather on mediated information that we have gathered from different sources. News media have a particularly important role, as they provide information about the outside world with the truthful depiction of events and background facts as the guiding principle (APME, 2019). Therefore, news media are a constituent element of modern democracies: If and only if citizens have access to diverse information, they have a fair chance of building informed opinions. For instance, that may also explain why the right to freedom of expression as formulated by the European Convention on Human Rights does not only include the freedom to hold opinions, but also the *right to receive information* "without interference by public authorities and regardless of frontiers" (Article 10, paragraph 1; see also Eskens et al., 2017).

Against this background, it seems understandable why the personalization of news feeds and websites, which has become increasingly common in recent years (see, e.g., Karimi et al., 2018; Thurman & Schifferes, 2012), is met with serious reservations. In particular, it has been argued that news personalization leads to the formation of filter bubbles (Dylko et al., 2017; Flaxman et al., 2016; Pariser, 2011) and echo chambers (Quattrociocchi et al., 2016; Sunstein, 2009), which may ultimately result in the gradual dissolution of the shared public sphere (Helberger, 2019). In other words, the main concern is that people tend to prefer information that is in line with their attitudes, their political convictions, and their worldview in general—and that this tendency is reinforced by personalization algorithms, which typically recommend content that is similar to content users have previously engaged with. If this were the case, users would be exposed to a highly biased selection of information—maybe even without noticing it. Indeed, it has been noted that many users are unaware of the fact that news feeds and websites are being personalized (Eslami et al., 2015; Fletcher & Nielsen, 2019; Powers, 2017; Swart, 2021).

Whether or not personalization algorithms nurture filter bubbles and echo chambers is the matter of an ongoing debate. News platforms argue that, in addition to personalizing content, they add more diverse content to prevent boredom and to foster the impression of a proper journalistic product (Bodó, 2019). Likewise, user data suggest that the effects of news personalization are complex. Recent data from the UK (Fletcher et al., 2021) show that news platforms that use personalization algorithms (e.g., Facebook, Twitter, or Google News) provide exposure to more diverse sources, as compared to non-personalized, self-selected news exposure, which, in the UK, often starts and ends with information provided by the BBC. These diverse sources, however, involve more partisan sources (i.e., leaning to the left or to the right of the political spectrum, such as breitbart.com or thecanary.co; see also Hasell, 2020; Muller & Schulz, 2021).

Typically, the above-mentioned concerns regarding echo chambers and filter bubbles are described from an "outside" perspective that views users as passive recipients of news. However, as previous research has demonstrated, users hold nuanced views on potential advantages and disadvantages of news personalization when asked about it explicitly (e.g., Bodó et al., 2019; Fletcher & Nielsen, 2019; Joris et al., 2021; Monzer et al., 2020): While they acknowledge that news personalization can help reduce information overload and leads to receiving more relevant news, they express concerns about being manipulated and caught up in filter bubbles. As they do often not know, which content is being filtered out

and for what reasons, users also tend to experience a lack of agency and control when confronted with the fact that their news feed is personalized. This seems particularly important as users are very sensitive to threats to their autonomy in the context of news (Groot Kormelink & Costera Meijer, 2014; see also Kozyreva et al., 2021). That is, users do not necessarily read all articles or watch all videos, but they still want to be able to access all content whenever they want. Note, however, that there seem to be important individual differences when it comes to evaluating the desirability of news personalization. It has been observed that individuals with a higher interest in news are more skeptical about news personalization (Joris et al., 2021). More specifically, this seems to be true for individuals who have a high interest in "hard" news topic and a rather low interest in "soft" news topics (Fletcher & Nielsen, 2019; see also Kozyreva et al., 2021). In contrast, people with lower education and people who experience less political efficacy place a higher value on news personalization (Bodó et al., 2019).

The findings described so far can be understood through the lens of the proposed model. As it seems, users generally tend to be autonomously motivated in the context of news: Being well-informed about current events and political affairs is considered a value in itself or at least an important precondition for becoming a responsible citizen by many people. Therefore, individuals desire autonomy and control over the personalization process, while simply receiving information that is tailored to one's interests is considered insufficient. However, inter- and intraindividual differences need to be taken into account. Some individuals seem to be regularly driven by controlled motivation: They do not place such a high value on being well-informed, but rather see navigating through news feeds and websites as a means to get the information they are looking for. Hence, they are more open to news personalization as long as it leads to the desired outcomes.

Based on the assumption that functioning democratic societies need open-minded news recipients who value diversity, one may argue that autonomous motivation is highly desirable in the context of news from a societal perspective. As news personalization could undermine diversity, there is reason to treat it with caution. This point of view seems to be supported from the perspective of individual well-being: Ultimately, news personalization may not only compromise autonomy, but also the individual's need to feel knowledgeable and competent—not to forget that the anticipated fragmentation of the public sphere could potentially also endanger the experience of relatedness to other human beings. According to our model, such need thwarting would result in reduced well-being, which would in turn undermine autonomous motivation. However, it should be noted that these predictions regarding needs and well-being have not been addressed explicitly in previous research. That is, while the evidence presented above allows at least preliminary conclusions regarding the role of motivational differences in the context of news feeds and websites, the long-term effects of personalization algorithms as hypothesized by our model remain to be tested.

In case it should turn out that receiving unbiased information is not only important for political debate and social cohesion, but also for need satisfaction, well-being, and ultimately self-development (see also Eskens et al., 2017), it would be important to think about finding ways to give back control and autonomy to users in the context of news personalization. One idea might be to rely on customization instead of personalization, that is, to make adjustments in news feeds and on news websites dependent on the active choices that users make (Harambam et al., 2018; Sullivan et al., 2019; for experimental evidence, see Zhu & Lee, 2020). Other ideas include increasing transparency about the kinds of data that are used to create personalized news feeds (Sullivan et al., 2019) and to raise awareness among users about the way personalization algorithms are operating (Harambam et al., 2018). In case participants feel unable to gain control over the personalization process, they may decide to alternate between different platforms or to obfuscate their digital footprint in order to reclaim autonomy (Harambam et al., 2018).

Music Streaming

Listening to music is not only one of people's favorite leisure activities (Rentfrow & Gosling, 2003), it can have a profound impact on subjective well-being (for an overview, see Hallam et al., 2017): People use music to regulate their moods and emotions, and to reminisce about past experiences. Thus, music streaming services may appear as the "celestial jukebox" that Goldstein (1994) had in mind—as a tool that offers listeners effortless and immediate access to any music imaginable whenever they want and wherever they are. However, the currently available music streaming services do not simply offer access to *any* music imaginable, but adjust the displayed artists, albums, and songs to the user's taste and preferences. This kind of *personalized* celestial jukebox is the result of a complex interplay between different algorithmic strategies (for an overview, see, e.g., Knees et al., 2019; Schedl et al., 2015). Ultimately, the personalization of music streaming can be described as the "datafication of listening" (Prey, 2016) as "all listening time is data-generating time" (Prey, 2019, p. 11), that is, as all actions that a user takes within the music streaming service will be analyzed and used to adapt the displayed content.

Overall, users seem to enjoy the personalization of music streaming services (e.g., Hagen, 2015; Kamehkhosh et al., 2020; Liikkanen & Åman, 2016). However, there are also potential problems and sources of dissatisfaction. First, user needs and goals do not necessarily align with the financial interests of the companies, which offer the music streaming service (e.g., Morris & Powers, 2015; Prey, 2018; 2020; Sun, 2019; see also Karakayali et al., 2018). While users may desire unlimited access to the "celestial jukebox," for instance, the companies may profit from restricting certain

features to paying customers (so-called "freemium model," see, for example, Holm & Günzel-Jensen, 2017; Voigt et al., 2017). Second, and maybe even more importantly in the present context, the music recommender systems do not always produce the results users are hoping for. In this context, it has been observed that some people stop using music streaming services because of a perceived lack of fit (Kjus, 2016) and that the behavior preferred by the users is not necessarily the behavior that is optimally supported by the recommender system (Lüders, 2019). Reversely put, the perceived match between the recommended content and the user's motivations and expectations is an important predictor for overall satisfaction and continued use (see, e.g., Jones, 2010).

Interestingly, it has been observed that users engage in a wide range of different activities when interacting with a music streaming service. For instance, users rely on recommendations to play music in the background that fits their current activity (such as working or exercising) or to find new music for later, that is, to quickly collect tracks that they plan to play in other contexts such as a house party (Garcia-Gathright et al., 2018). In addition, the general possibility to access specific recordings whenever and wherever they want (i.e., ubiquity), is a key gratification for some users (Mäntymäki & Najmul Islam, 2015). Apart from that, it has been noted that users rely on recommendations to engage with new music (Garcia-Gathright et al., 2018) and that they may perceive the experience of interacting with the music streaming service as enjoyable in its own right (Mäntymäki & Najmul Islam, 2015). Moreover, recommendations can support the discovery of new music and the broadening of one's musical taste (Mäntymäki & Najmul Islam, 2015), which may especially be important for users who want to immerse themselves in the listening experience, that is, for users who interact with the music streaming service, because they want to listen to new music (Garcia-Gathright et al., 2018).

As users differ regarding their preferred activities (i.e., their reasons to use a music streaming service), researchers have proposed different user personas (Lee & Price, 2015; see also Fuller et al., 2016; Lee et al., 2019). Note, however, that these personas are not necessarily conceptualized as stable personality traits: While an individual may identify with a specific persona, it is also possible to show different personas—or a combination of personas—at different points in time. Among the seven proposed personas, there are three, which mirror the tendency to avoid the use of recommender systems, either because music is considered to be something very personal (*music recluse*) or because one does not believe that recommender systems provide adequate and helpful recommendations (*non-believer, music epicurean*). Both the *wanderer* (who likes to be surprised and to discover new music) and the *active curator* (who puts a lot of effort into curating music) have a high interest in engaging with different kinds of music. On the other hand, both the *guided listener* (who does not have a strong musical taste and is therefore willing to hand over control to the music streaming service) and the *addict* (who listens repeatedly to favorite songs and albums) have a comparably low interest in engaging with different kinds of music.

However, how can the different activities and the different user personas be analyzed from the perspective of the proposed model? As far as the different activities are concerned, some seem to be driven by controlled motivation as they are aimed at achieving a particular goal (e.g., playing music in the background, finding new music for later); in contrast, others seem to be driven by autonomous motivation as they are more about the process of interacting with the music streaming service (e.g., engaging with new music, discovering new music and broadening one's musical taste). The differentiation between autonomous and controlled motivation can also be used to distinguish the user personas from one another. Note also that this allows for a broader perspective, as the opposition between controlled and autonomous motivation is—other than the enumeration of different personas—not limited to the context of music streaming.

Clearly, the wanderer and the active curator, who have a high interest in engaging with new music, seem to represent instances of autonomous motivation, while the guided listener and the addict represent instances of controlled motivation. Crucially, all of these personas do not mind relying on recommendation algorithms—although they may have different expectations regarding their operating characteristics. However, the opposite is true for the remaining three personas—the music epicurean, the music recluse, and the non-believer—who genuinely dislike and avoid music recommendations. This is particularly interesting, as the music epicurean and the music recluse also place a high value on engaging with music, that is, as they also represent instances of autonomous motivation. Overall, this seems to indicate that autonomous users may have ambivalent feelings with respect to music recommender systems.

In short, previous research has demonstrated that humans differ regarding their motivation to use music streaming services and that their satisfaction with these streaming services consequently depends on different aspects of the personalization process. The existing findings can be reinterpreted using the proposed model. However, there are some components, which have not been explicitly investigated empirically so far. In particular, user satisfaction was typically not operationalized as the satisfaction of the basic psychological needs, but rather as an overall evaluation of the system or as the intended long-term adoption of the system (see, e.g., Jones, 2010). Consequently, we know only little about the differential impact of personalization in the context of music streaming on the satisfaction of the three basic psychological needs for autonomy, competence, and relatedness. While the above-mentioned evidence makes it plausible to speculate that experiencing a lack of autonomy is what commonly upsets users with respect to the personalization of their music streaming experience, competence and

relatedness have received limited attention in previous research. With respect to competence, one may at least suspect that those autonomously motivated users that do not want to rely on recommender systems (such as the music epicurean or the music recluse) feel that algorithmic selection undermines their competence. How the personalization of music streaming affects social relations, however, remains relatively unclear. One could hypothesize that personalization ultimately disrupts the shared social sphere, which might be particularly problematic for autonomously motivated music listeners who place great emphasis on sharing and discussing music with others or who use music as a means to achieve social distinction (e.g., Webster, 2021). However, personalization could also enable the formation of new social groups who share an interest in the same kind of music (e.g., Park & Kaneshiro, 2021). Against this background, research in the context of music streaming that explicitly addresses the impact on the basic psychological needs is highly desirable. Apart from that, it seems worth exploring to what extent the motivation to use a music streaming service remains stable over time and to what extent it depends on the specific context. Moreover, one may investigate what distinguishes those autonomously motivated users who rely on music recommendation algorithms from those who do not.

Online Dating

Using online services has become a part of dating for many people. For instance, about one third of U.S. adults state that they have used a dating site or app—among young adults it is even half of the population (Pew Research Center, 2020). Overall, these online services are evaluated rather positively and the number of couples who have met online has been increasing over the last years (Pew Research Center, 2020; Rosenfeld & Thomas, 2012; Rosenfeld et al., 2019). In fact, more than one third of American couples that married between 2005 and 2012 had met online (Cacioppo et al., 2013). From a theoretical point of view, it has been argued that online dating differs from offline dating in three crucial respects (Finkel et al., 2012). First, online dating services provide convenient *access* to an unprecedented number of potential partners: The number of people that one can get in touch with exceeds the number of people that one meets in one's everyday normal life by far. Second, online dating services enable users to engage in computer-mediated *communication* before meeting in person. Third, many online dating services use *matching algorithms* that use the data provided by the users to suggest potential partners, typically based on the principle of either similarity or complementarity (see also Fisher, 2009; Schwartz, 2006; Warren, 2002).

At first glance, this sounds promising—and it certainly is in some cases and for some individuals. Indeed, it has been reported that couples who have met online show slightly lower separation and divorce rates as well as higher marital satisfaction compared to couples wo met offline (Cacioppo et al., 2013; but see Joel et al., 2017). At second glance, however, online dating services are also associated with various downsides that flow from the combination of features that these services offer. First, having access to more potential partners is not always experienced as positive. Rather the contrary, choice overload can undermine feelings of autonomy and control within the dating process (D'Angelo & Toma, 2017; Lenton et al., 2008; Lenton & Francesconi, 2010). Ultimately, the feeling of being overwhelmed by the available options, that is, by the sheer number of people that one could and may want to get in touch with, often leads users to making superficial and ill-advised decisions (Chiou & Yang, 2010; Pronk & Denissen, 2020; Wu & Chiou, 2009; Yang & Chiou, 2010). Second, and maybe even more importantly in the present context, knowing that various kinds of information about the users of an online dating service are compared and matched using an algorithm may elicit "an evaluative, assessment-oriented mindset" (Finkel et al., 2012, p. 3). By offering access to an extremely high number of potential partners as well as a means to deal with this number, online dating services may encourage users to engage in what has been called "relationshopping" (Heino et al., 2010) or the "McDonaldizing of romance" (Ahuvia et al., 2009; see also Lawson & Leck, 2006). In the long run, such an objectification of potential partners can have negative effects on the dating life of the individual: If one is constantly hoping that "an even more congruent soul mate is waiting […] on the next website" (Coren, 2006), the willingness to commit to one particular person is likely to be undermined (see Finkel et al., 2012).

In addition to these general observations, it should be noted that different people use online dating services for different purposes and that this may also affect their user experience (Gatter & Hodkinson, 2016; Hsiao & Dillahunt, 2017; Lawson & Leck, 2006; Sumter et al., 2017; van de Wiele & Tong, 2014; see also Zytko et al., 2018). While online dating services are typically used to find a partner for a long-term committed relationship, users also look for new friends and people to talk to (e.g., to become part of the local community after moving to a new city) or for casual sex partners. Apart from that, there are users who do not aim at fulfilling such social relationship needs, but who use the websites or apps just for fun, that is, because they find it entertaining to browse the different profiles, because they are curious about the world of online dating, or because their peers use the service and they want to try it as well. Moreover, users may seek the thrill of excitement and think of online dating as some kind of adventure or look for self-worth validation trough receiving positive feedback and compliments from others.

In terms of the proposed model, this clearly shows that users of online dating services differ regarding their motivation. While the wish to get to know new people or a potential partner is likely to be driven by autonomous

motivation, users who engage in online dating to receive approval from others or to improve their self-esteem are driven by controlled motivation. Arguably, these motivational differences also influence the perception of the matching algorithms. For a user with controlled motivation, the potential datafication and objectification of individuals should not pose a problem per se. If one is looking for positive feedback from others or for a casual sex partner, for instance, it does not matter whether the algorithm finds the "perfect" match or whether the algorithm reduces people to two-dimensional displays of information. Simply put, such a user will already be satisfied with the recommender algorithm if it leads to getting positive feedback from *someone* or the opportunity to have sex with *someone*, that is, if the algorithm helps to achieve certain instrumental goals. On the contrary, an autonomously motivated user will not be satisfied with *any* match. Rather, an autonomously motivated user desires at least some control over the dating process and refuses to see others as an accumulation of data points. Against this background, it is worrying that matching algorithms seem to encourage an assessment-oriented mindset: This could imply that the users' autonomous motivation is being undermined by the very setup of online dating services. The marketization of romantic relationships that is reinforced by algorithmic filtering may hinder and disrupt the ideal dating process that many users have in mind. Interestingly and in line with this, it has been demonstrated that users are most satisfied with online dating services which combine active user choices with automatic algorithmic matching (Tong et al., 2016), that is, with online dating services that help the users to deal with the high number of other users, while still giving them the chance to freely interact with all of them. Again, it should be emphasized that these conclusions are in line with the existing literature, but that more research is needed to confirm the idea that the effect of matching algorithms is linked to the individual's motivation. Once more, this particularly applies to the connection between personalization and the satisfaction of the basic psychological needs. The above-mentioned studies allow at least some empirically informed speculations. On the one hand, it seems that matching algorithms can undermine autonomy and competence in a field where these two needs are particularly important to many people. When it comes to finding a partner for a relationship, individuals desire control over the dating process as well as the feeling that they are capable of deciding who is good for them and who is not. On the other hand, the marketization of romantic relationships may also endanger the satisfaction of the need for relatedness. The algorithmically enforced notion that one is not interacting directly with other persons, but rather with abstract profiles that are compared and matched, could also explain why some people remain skeptical with respect to online dating. In view of the omnipresence of online dating in modern societies, further clarifying these hypothesized causal links and mechanisms is a crucial task for future research.

Discussion

The personalization of digital environments, which is based on adaptive algorithmic processes, is something fundamentally new: It creates a virtual world that is different for each individual—and that constantly changes in different ways for different individuals. Hence, it is of utmost importance to understand the consequences of this technological leap for human behavior and well-being. Against this background, we introduced a model with five crucial features. First, the model is focused exclusively on the impact of personalization processes. That is, instead of taking a concept such as "screen time" as a starting point for our investigation that is too broad to capture the complex processes underlying the interactions with digital environments (Granic et al., 2020; Orben et al., 2020), we picked a specific phenomenon with specific operating characteristics that drives many of the contemporary changes in the digital realm. This gave us the opportunity to provide a detailed analysis of the mechanisms of personalization and their impact on the individual. Second, the model is based on an established theory of motivation, needs, and well-being: Self-Determination Theory (SDT; Deci & Ryan, 2000, 2008; Ryan & Deci, 2017). Using SDT as a starting point allowed us to identify the psychological impact of personalization in digital environments, a novel phenomenon, by building on a strong foundation of knowledge. This seems particularly important as investigating the psychological effects of personalization is still an emerging field of research in which many processes and mechanisms remain to be fleshed out by empirical studies. Third, however, our model is not merely a working model, but able to integrate a wide range of findings from different areas of application, as we have demonstrated using the examples of news feeds and websites, music streaming, and online dating.

Fourth, based on the distinction between autonomous and controlled motivation, our model explicitly allows for individual differences. That is, we take into account the fact that not all individuals react to personalization processes in the same way. Of course, there may be other sources of inter-individual variance beyond motivational differences that could be used for expanding the present model (e.g., power usage, trust or prior experiences with personalization; Glikson & Woolley, 2020; Sundar, 2020). As the motivational differences that we have discussed are deeply rooted within the individual and closely connected to need satisfaction and ultimately well-being, however, it seemed justified and important to use them as the key building block of our model. In other words, we assume that the motivational differences lie at the heart of many of the differences that can be observed between individuals. Fifth, and related to the previous point, the model offers a nuanced view of the potential risks and benefits of the personalization of digital environments. Simply put, we neither claim that the personalization of digital environments is good or bad per se. Rather, our model provides a framework that can help to determine *when* and

why personalization may have *which* positive or negative effects. So which conclusions can be drawn based on the proposed model and the studies that we have interpreted through its lens?

Integrative Summary

When considering individuals with *controlled motivation*, that is, individuals whose behavior is energized by the goal to achieve some instrumentally separable consequence, the answer seems straightforward: As long as the personalization algorithm leads to the desired outcomes, the individual will be satisfied. For instance, an individual with controlled motivation expects a personalized news website to show content that the person finds interesting, a music streaming service to play music that the person likes, and the online dating provider to suggest matches that the person considers attractive. In other words, when considering individuals with controlled motivation, the personalization of digital environments is merely a *technical problem* that can be solved by developing better algorithms that maximize the likelihood of achieving the desired outcome.

However, when also considering individuals with *autonomous motivation*, matters become more complex. Importantly, as they also need to find a way to deal with information and choice overload in digital environments, autonomously motivated individuals are not strictly opposed to personalization processes per se. Thus, a well-designed algorithm is not only important for individuals with a controlled motivation, but also for individuals with an autonomous motivation. However, autonomously motivated individuals do not want personalization to happen behind their backs: Even when they give up autonomy, they want to do so autonomously. More specifically, an autonomously motivated individual will want to know *that* a personalization algorithm is operating (e.g., that not all potential partners are shown on a dating website) and *how* the personalization algorithm is operating (e.g., which selection criteria the dating website applies). Moreover, autonomously motivated individuals want to have the possibility to influence how the personalization algorithm is operating (e.g., to change the selection criteria or even to decide against using the algorithm).

Which lessons can be learned from that, especially with respect to need satisfaction and well-being? As one may argue, a well-designed personalization algorithm, which is able to capture the individual's interests and goals and to recommend content that fits these interests and goals, will help to achieve hedonic well-being. That is, it will help to maximize positive and to minimize negative experiences. Contributing to the full functioning of the individual (i.e., achieving eudaimonic well-being), however, requires more than good recommendations that work as gratifications: It requires respecting the needs for autonomy, competence, and relatedness. As described above, this does not imply ending the use of personalization algorithms. Rather, it implies that more transparency is needed and that individuals should be given the opportunity to play an active role in the personalization process if they wish to. Importantly, these conclusions derived from our psychological model that is focused on the impact of personalization on the individual are well in line with the suggestions brought forward from an ethical and societal perspective (e.g., Bozdag, 2013; Burr et al., 2018; Fast & Jago, 2020; Matz et al., 2020; Milano et al., 2020; Mittelstadt et al., 2016; Taddeo & Floridi, 2018).

In order to being able to implement these recommendations, at least two well-known problems need to be taken into account. First, the road to building explainable personalization algorithms may turn out to be long and stony: Providing a satisfying verbal explanation for complex and ever-changing mathematical models is far from being trivial (for a review, see Nunes & Jannach, 2017)—and some even argue that it may turn out to be impossible (Yampolskiy, 2020). Second, most personalization algorithms were developed and are operated by companies. While it may be desirable for users to be informed about the functioning of these algorithms and to have the possibility to influence their operating characteristics, this does not necessarily apply to the companies as well (e.g., Newell & Marabelli, 2015). The personalization algorithms are their key assets. Hence, being too open about the way they are designed may endanger the companies' business model and their financial interests. While our model offers no rationale for solving these problems, it provides a clear argument for why they should be solved.

Open Questions and Outlook

From our perspective, the proposed model provides a valuable starting point for further discussions and investigations. As we believe that our model will prove to be useful in all domains in which personalization takes place, one possible avenue is to apply it to other fields beyond news feeds and websites, music streaming, and online dating. Other relevant domains include, but are not limited to, education (e.g., intelligent tutoring systems, Tetzlaff et al., 2021), marketing (e.g., personalized advertising, Walrave et al., 2018) or health communication (e.g., conversational agents, Kocaballi et al., 2019). Beyond the imminent goals underlying the development of personalized systems (e.g., knowledge acquisition, increasing product purchases), participants' motivational underpinnings, effects on well-being, and downstream influences on future motivational tendencies deserve attention.

Note also that investigating the effects of personalization on individuals is still an emerging field of research. As already mentioned in the respective sections of the manuscript, the existing evidence in the three fields of application allows conclusions regarding the role of motivational differences, while many of the hypothesized long-term effects of personalization algorithms on need satisfaction and well-being remain to be confirmed by future studies. More specifically, contemporary research on human experience when interacting with digital technologies is often limited to "user

satisfaction," and much of the empirical results we considered were based on such measures. Garcia-Garthright et al. (2018), for example, inferred user satisfaction from page views, plays, skips, and related behavior. The virtue of field research notwithstanding, these and related approaches provide only indirect evidence on well-being, particularly on potential nuances, such as need satisfaction or eudaimonic well-being that may be outside the goals specified by the technology's creators. Based on the effects proposed by our model and based on our reconstruction of the existing evidence, we believe that future research can profit from more direct measures of need satisfaction and eudaimonic well-being in response to digital technologies.

Another avenue for future research is the role of amotivation in studies on personalization and the use of digital media more generally. Some research suggests that the use of digital media, such as social networking sites, is regularly based on a lack of self-determination and intention, rather than autonomous or controlled motivation (e.g., Alt, 2015). We suspect that personalization could prolong the use of digital media in a state of amotivation even if the activity lacks personal importance for the individual. If this was the case, personalization of digital environments could contribute to lower well-being among amotivated individuals. This nexus is largely speculative, as the studies that we integrated did not explicitly address amotivational states. Hence, future research on amotivation and digital media use in the context of personalization is encouraged.

On a more general note, it seems important to keep in mind how far-reaching the potential implications of personalized digital environments actually are. Some of these implications can be addressed by psychological theory and research (as we tried in the present work), but we acknowledge that other disciplines are better suited to investigate the epistemic, political, sociological, and legal consequences of personalization. Thus, we encourage interdisciplinary research groups to address the opportunities and challenges that are looming in the presence of personalized environments. This seems even more important, as the potential of personalization is far from being fully exploited.

Today's personalized environments are limited to the information encountered on computers. You have to look at your smartphone or the computer screen to enter a personalized world. The tree in front of your house and the roadside billboard are the same, irrespective whether you, your partner or your neighbor looks at it. This might not be the case in the future. At least with respect to the latter object, technologies are readily available to personalize billboards based on information about individuals close to them (e.g., Lopez-Nores et al., 2015). As more and more environments will be personalized, its influence on well-being (and other consequences) will become an even more important question in the future. We are just in the beginning to grasp the psychological consequences of living in a personalized world.

Conclusion

Well-being in the age of digital media is matter of concern for scientists and the public alike. Our model and evidence from three fields of application suggest that motivational predispositions predict the extent to which personalization of digital environments leads to need satisfaction and well-being: Whenever individuals are driven by controlled motivation, efficient personalization is the key determinant for user satisfaction. However, this kind of user satisfaction can only guarantee hedonic but not eudaimonic well-being. In addition, autonomously motivated individuals will only achieve need satisfaction and ultimately eudaimonic well-being when they experience the personalization process as transparent and when they have the opportunity to play an active role in it. As navigating through personalized digital environments is daily business for most individuals living in modern societies, considering these psychological effects when designing recommender systems and personalization algorithms seems highly relevant—not only from an individual but also from a societal perspective.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Fabian Hutmacher https://orcid.org/0000-0002-0018-2559
Markus Appel https://orcid.org/0000-0003-4111-1308

References

Ahuvia, A. C., Adelman, M. B., & Izberk-Bilgin, E. (2009). Commercial channels for mate seeking. In H. Reis & S. Sprecher (Eds.), *Encyclopedia of human relationships* (Vol. 1, pp. 237–240). Sage

Alt, D. (2015). College students' academic motivation, media engagement and fear of missing out. *Computers in Human Behavior*, *49*, 111–119. https://doi.org/10.1016/j.chb.2015.02.057

Amarnath, D. D., & Jaidev, U. P. (2020). Toward an integrated model of consumer reactance: A literature analysis. *Management Review Quarterly*, *71*(1), 41–90. https://doi.org/10.1007/s11301-020-00180-y

Appel, M., Marker, C., & Gnambs, T. (2020). Are social media ruining our lives? A review of meta-analytic evidence. *Review of General Psychology*, *24*(1), 60–74. https://doi.org/10.1177/1089268019880891

Arora, N., Dreze, X., Ghose, A., Hess, J. D., Iyengar, R., Jing, B., Joshi, Y., Kumar, V., Lurie, N., Neslin, S., Su, M., Syam, N.,

Thomas, J., Zhang, Z. J., & Sajeesh, S. (2008). Putting one-to-one marketing to work: Personalization, customization, and choice. *Marketing Letters*, *19*(3-4), 305–321. https://doi.org/10.1007/s11002-008-9056-z

Association of Press Managing Editors (APME) (2019). Statement of ethical principles [Online document]. http://www.apme.com/?page=EthicsStatement

Bodó, B. (2019). Selling news to audiences – a qualitative inquiry into the emerging logics of algorithmic news personalization in European quality news media. *Digital Journalism*, *7*(8), 1054–1075. https://doi.org/10.1080/21670811.2019.1624185

Bodó, B., Helberger, N., Eskens, S., & Möller, J. (2019). Interested in diversity: The role of user attitudes, algorithmic feedback loops, and policy in news personalization. *Digital Journalism*, *7*(2), 206–229. https://doi.org/10.1080/21670811.2018.1521292

Bozdag, E. (2013). Bias in algorithmic filtering and personalization. *Ethics and Information Technology*, *15*(3), 209–227. https://doi.org/10.1007/s10676-013-9321-6

Brehm, J. W. (1966). *A theory of psychological reactance*. Academic Press.

Brehm, S. S., & Brehm, J. W. (1981). *Psychological reactance: A theory of freedom and control*. Academic Press.

Buongiorno, F. (2021). Towards a philosophical understanding of digital environments. *Philosophy Study*, *11*(2), 96–106. https://doi.org/10.17265/2159-5313/2021.02.003

Burr, C., Cristianini, N., & Ladyman, J. (2018). An analysis of the interaction between intelligent software agents and human users. *Minds and Machines*, *28*(4), 735–774. https://doi.org/10.1007/s11023-018-9479-0

Burr, C., & Floridi, L. (2020). The ethics of digital well-being: A multidisciplinary perspective. In C. Burr & L. Floridi (Eds.), *Ethics of digital well-being* (pp. 1–29). Springer. https://doi.org/10.1007/978-3-030-50585-1_1

Cacioppo, J. T., Cacioppo, S., Gonzaga, G. C., Ogburn, E. L., & VanderWeele, T. J. (2013). Marital satisfaction and break-ups differ across on-line and off-line meeting venues. *Proceedings of the National Academy of Sciences*, *110*(25), 10135–10140. https://doi.org/10.1073/pnas.1222447110

Calvo, R. A., Peters, D., Vold, K., Ryan, R. M., Burr, C., & Floridi, L. (2020). Supporting human autonomy in AI systems: A framework for ethical enquiry. In C. Burr & L. Floridi (Eds.), *Ethics of digital well-being: A multidisciplinary approach* (pp. 31–54). Springer. https://doi.org/10.1007/978-3-030-50585-1_2

Chiou, W., & Yang, M. (2010). The moderating role of need for cognition on excessive searching bias: A case of finding romantic partners online. In B. K. Wiederhold, G. Riva, & S. I. Kim (Eds.), *Annual review of cybertherapy and telemedicine* (pp. 120–122). IOS Press. https://doi.org/10.3233/978-1-60750-561-7-120

Coren, V. (2006, October 15). The curse of true love. The Guardian. http://www.guardian.co.uk/commentisfree/2006/oct/15/comment.victoriacoren

D'Angelo, J. D., & Toma, C. L. (2017). There are plenty of fish in the sea: The effects of choice overload and reversibility on online daters' satisfaction with selected partners. *Media Psychology*, *20*(1), 1–27. https://doi.org/10.1080/15213269.2015.1121827

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology*, *49*(3), 182–185. https://doi.org/10.1037/a0012801

Dylko, I., Dolgov, I., Hoffman, W., Eckhart, N., Molina, M., & Aaziz, O. (2017). The dark side of technology: An experimental investigation of the influence of customizability technology on online political selective exposure. *Computers in Human Behavior*, *73*, 181–190. https://doi.org/10.1016/j.chb.2017.03.031

Eskens, S., Helberger, N., & Moeller, J. (2017). Challenged by news personalisation: Five perspectives on the right to receive information. *Journal of Media Law*, *9*(2), 259–284. https://doi.org/10.1080/17577632.2017.1387353

Eslami, M., Rickman, A., Vaccaro, K., Aleyasen, A., Vuong, A., Karahalios, K., Hamilton, K., & Sandvig, C. (2015). "I always assumed that I wasn't really that close to [her]": Reasoning about invisible algorithms in news feeds. Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, Seoul, Republic of Korea, 18–23 April, 2015 (pp.153–162). http://dx.doi.org/10.1145/2702123.2702556

Fan, H., & Poole, M. S. (2006). What is personalization? Perspectives on the design and implementation of personalization in information systems. *Journal of Organizational Computing and Electronic Commerce*, *16*(3-4), 179–202. https://doi.org/10.1080/10919392.2006.9681199

Fast, N. J., & Jago, A. S. (2020). Privacy matters, or does it? Algorithms, rationalization, and the erosion of concern for privacy. *Current Opinion in Psychology*, *31*, 44–48. https://doi.org/10.1016/j.copsyc.2019.07.011

Finkel, E. J., Eastwick, P. W., Karney, B. R., Reis, H. T., & Sprecher, S. (2012). Online dating: A critical analysis from the perspective of psychological science. *Psychological Science in the Public Interest*, *13*(1), 3–66. https://doi.org/10.1177/1529100612436522

Fisher, H. (2009). *Why him? Why her?* Henry Holt.

Flaxman, S., Goel, S., & Rao, J. M. (2016). Filter bubbles, echo chambers, and online news consumption. *Public Opinion Quarterly*, *80*(S1), 298–320. https://doi.org/10.1093/poq/nfw006

Fletcher, R., Kalogeropoulos, A., & Nielsen, R. K. (2021). More diverse, more politically varied: How social media, search engines and aggregators shape news repertoires in the United Kingdom. *New Media & Society*, 146144482110273. Advance online publication. https://doi.org/10.1177/14614448211027393

Fletcher, R., & Nielsen, R. K. (2019). Generalised scepticism: How people navigate news on social media. *Information, Communication & Society*, *22*(12), 1751–1769. https://doi.org/10.1080/1369118X.2018.1450887

Fuller, J., Hubener, L., Kim, Y. S., & Lee, J. H. (2016). Elucidating user behavior in music services through persona and gender. International Society for Music Information Retrieval Conference. New York, NY, 7–11 August 2016.

Garcia-Gathright, J., St. Thomas, B., Hosey, C., Nazari, Z., & Diaz, F. (2018). Understanding and evaluating user satisfaction with music discovery. The 41st International ACM SIGIR Conference on Research & Development in Information Retrieval, Ann Arbor, MI, 8–12 July, 2018. https://doi.org/10.1145/3209978.3210049

Gatter, K., & Hodkinson, K. (2016). On the differences between Tinder™ versus online dating agencies: Questioning a myth. An exploratory study. *Cogent Psychology*, *3*(1), 1162414. https://doi.org/10.1080/23311908.2016.1162414

Glikson, E., & Woolley, A. W. (2020). Human trust in artificial intelligence: Review of empirical research. *Academy of Management Annals*, *14*(2), 627–660. https://doi.org/10.5465/annals.2018.0057

Goldstein, P. (1994). *Copyright's highway: The law and lore of copyright from Gutenberg to the celestial jukebox*. Hill and Wang.

Granic, I., Morita, H., & Scholten, H. (2020). Beyond screen time: Identity development in the digital age. *Psychological Inquiry*, *31*(3), 195–223. https://doi.org/10.1080/1047840X.2020.1820214

Groot Kormelink, T., & Costera Meijer, I. (2014). Tailor-made news: Meeting the demands of news users on mobile and social media. *Journalism Studies*, *15*(5), 632–641. https://doi.org/10.1080/1461670X.2014.894367

Hagen, A. N. (2015). The playlist experience: Personal playlists in music streaming services. *Popular Music and Society*, *38*(5), 625–645. https://doi.org/10.1080/03007766.2015.1021174

Hallam, S., Creech, A., & Varvarigou, M. (2017). Well-being and music leisure activities through the lifespan. In R. Mantie & G. D. Smith (Eds.), *The Oxford handbook of music making and leisure* (pp. 31–60). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190244705.013.30

Harambam, J., Helberger, N., & van Hoboken, J. (2018). Democratizing algorithmic news recommenders: How to materialize voice in a technologically saturated media ecosystem. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *376*, 20180088. https://doi.org/10.1098/rsta.2018.0088

Hasell, A. (2020). Shared emotion: The social amplification of partisan news on Twitter. *Digital Journalism*, *9*(8), 1085–1102. https://doi.org/10.1080/21670811.2020.1831937.

Heino, R., Ellison, N., & Gibbs, J. (2010). Relationshopping: Investigating the market metaphor in online dating. *Journal of Social and Personal Relationships*, *27*(4), 427–447. https://doi.org/10.1177/0265407510361614

Helberger, N. (2019). On the democratic role of news recommenders. *Digital Journalism*, *7*(8), 993–1012. https://doi.org/10.1080/21670811.2019.1623700

Holm, A. B., & Günzel-Jensen, F. (2017). Succeeding with freemium: Strategies for implementation. *Journal of Business Strategy*, *38*(2), 16–24. https://doi.org/10.1108/JBS-09-2016-0096

Hsiao, J.C.-Y., & Dillahunt, T. R. (2017). People-nearby applications: How newcomers move their relationships offline and develop social and cultural capital. Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing, Portland, OR, 25 Febuary–1 March, 2017 (pp. 26–40). http://doi.org/10.1145/2998181.2998280

Joel, S., Eastwick, P. W., & Finkel, E. J. (2017). Is romantic desire predictable? Machine learning applied to initial romantic attraction. *Psychological Science*, *28*(10), 1478–1489. https://doi.org/10.1177/0956797617714580

Jones, N. (2010). *User perceived qualities and acceptance of recommender systems: The role of diversity* [*Doctoral dissertation*. École Polytechnique Fédérale de Lausanne]. EPFL. https://doi.org/10.5075/epfl-thesis-4680

Joris, G., Grove, F. D., Van Damme, K., & De Marez, L. (2021). Appreciating news algorithms: Examining audiences' perceptions to different news selection mechanisms. *Digital Journalism*, *9*(5), 589–618. https://doi.org/10.1080/21670811.2021.1912626

Kamehkhosh, I., Bonnin, G., & Jannach, D. (2020). Effects of recommendations on the playlist creation behavior of users. *User Modeling and User-Adapted Interaction*, *30*(2), 285–322. https://doi.org/10.1007/s11257-019-09237-4

Karakayali, N., Kostem, B., & Galip, I. (2018). Recommendation systems as technologies of the self: Algorithmic control and the formation of music taste. *Theory, Culture & Society*, *35*(2), 3–24. https://doi.org/10.1177/0263276417722391

Karimi, M., Jannach, D., & Jugovac, M. (2018). News recommender systems – Survey and roads ahead. *Information Processing & Management*, *54*(6), 1203–1227. https://doi.org/10.1016/j.ipm.2018.04.008

Kjus, Y. (2016). Musical exploration via streaming services: The Norwegian experience. *Popular Communication*, *14*(3), 127–136. https://doi.org/10.1080/15405702.2016.1193183

Knees, P., Schedl, M., Ferwerda, B., & Laplante, A. (2019). User awareness in music recommender systems. In M. Augstein, E. Herder, & W. Wörndl (Eds.), *Personalized human-computer interaction* (pp. 223–252). De Gruyter. https://doi.org/10.1515/9783110552485-009

Kocaballi, A. B., Berkovsky, S., Quiroz, J. C., Laranjo, L., Tong, H. L., Rezazadegan, D., Briatore, A., & Coiera, E. (2019). The personalization of conversational agents in health care: Systematic review. *Journal of Medical Internet Research*, *21*(11), e15360. https://doi.org/10.2196/15360

Kozyreva, A., Lorenz-Spreen, P., Hertwig, R., Lewandowsky, S., & Herzog, S. M. (2021). Public attitudes towards algorithmic personalization and use of personal data online: Evidence from Germany, great Britain, and the United States. *Humanities and*

Social Sciences Communications, *8*(1), 1–11. https://doi.org/10.1057/s41599-021-00787-w

Lawson, H. M., & Leck, K. (2006). Dynamics of internet dating. *Social Science Computer Review*, *24*(2), 189–208. https://doi.org/10.1177/0894439305283402

Lee, G., & Lee, W. J. (2009). Psychological reactance to online recommendation services. *Information & Management*, *46*(8), 448–452. https://doi.org/10.1016/j.im.2009.07.005

Lee, J. H., & Price, R. (2015). Understanding users of commercial music services through personas: Design implications. International Society for Music Information Retrieval Conference, Málaga, Spain, 26–30 October, 2015.

Lee, J. H., Pritchard, L., & Hubbles, C. (2019). Can we listen to it together? Factors Influencing reception of music recommendations and post-recommendation behavior. International Society for Music Information Retrieval Conference, Delft, Netherlands, 4–8 November, 2012.

Lenton, A. P., Fasolo, B., & Todd, P. M. (2008). "Shopping" for a mate: Expected versus experienced preferences in online mate choice. *IEEE Transactions on Professional Communication*, *51*(2), 169–182. https://doi.org/10.1109/TPC.2008.2000342

Lenton, A. P., & Francesconi, M. (2010). How humans cognitively manage an abundance of mate options. *Psychological Science*, *21*(4), 528–533. https://doi.org/10.1177/0956797610364958

Liang, T. P., Lai, H. J., & Ku, Y. C. (2006). Personalized content recommendation and user satisfaction: Theoretical synthesis and empirical findings. *Journal of Management Information Systems*, *23*(3), 45–70. https://doi.org/10.2753/MIS0742-1222230303

Liikkanen, L. A., & Åman, P. (2016). Shuffling services: Current trends in interacting with digital music. *Interacting with Computers*, *28*(3), 352–371. https://doi.org/10.1093/iwc/iwv004

Lopez-Nores, M., Blanco-Fernández, Y., Pazos-Arias, J. J., Gil-Solla, A., & Ramos-Cabrer, M. (2015). Augmented reality, smart codes and cloud computing for personalized interactive advertising on billboards. 2015 10th International Workshop on Semantic and Social Media Adaptation and Personalization (SMAP), 5–6 November, 2015, Trento, Italy (pp. 1–6). IEEE.

Lüders, M. (2019). Pushing music: People's continued will to archive versus Spotify's will to make them explore. *European Journal of Cultural Studies*, *24*(4), 952–969. https://doi.org/10.1177/1367549419862943

Mäntymäki, M., & Najmul Islam, A. K. M. (2015). Gratifications from using freemium music streaming services: Differences between basic and premium users. International Conference on Information Systems, Fort Worth, TX, 13–16 December 2015.

Matz, S. C., Appel, R. E., & Kosinski, M. (2020). Privacy in the age of psychological targeting. *Current Opinion in Psychology*, *31*, 116–121. https://doi.org/10.1016/j.copsyc.2019.08.010

Mejtoft, T., Lindmark, T., Söderström, U., & Cripps, H. (2020). The user experience of personalized content. In A. Pucihar, M. Kljajić Borštnar, R. Bons, H. Cripps, A. Sheombar, & D. Vidmar (Eds.), *33rd bled eConference – enabling technology for a sustainable society* (pp. 147–158). University of Maribor University Press. https://doi.org/10.18690/978-961-286-362-3.10

Milano, S., Taddeo, M., & Floridi, L. (2020). Recommender systems and their ethical challenges. *AI & Society*, *35*(4), 957–967. https://doi.org/10.1007/s00146-020-00950-y

Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big Data & Society*, *3*(2), 1–21. https://doi.org/10.1177/2053951716679679

Monzer, C., Moeller, J., Helberger, N., & Eskens, S. (2020). User perspectives on the news personalization process: Agency, trust and utility as building blocks. *Digital Journalism*, *8*(9), 1142–1162. https://doi.org/10.1080/21670811.2020.1773291

Morris, J. W., & Powers, D. (2015). Control, curation and musical experience in streaming music services. *Creative Industries Journal*, *8*(2), 106–122. https://doi.org/10.1080/17510694.2015.1090222

Muller, P., & Schulz, A. (2021). Alternative media for a populist audience? Exploring political and media use predictors of exposure to Breitbart, Sputnik, and Co. *Information, Communication, & Society*, *24*(2), 277–293. https://doi.org/10.1080/1369118X.2019.1646778

Newell, S., & Marabelli, M. (2015). Strategic opportunities (and challenges) of algorithmic decision-making: A call for action on the long-term societal effects of 'datification'. *The Journal of Strategic Information Systems*, *24*(1), 3–14. http://dx.doi.org/10.1016/j.jsis.2015.02.001

Nunes, I., & Jannach, D. (2017). A systematic review and taxonomy of explanations in decision support and recommender systems. *User Modeling and User-Adapted Interaction*, *27*(3-5), 393–444. https://doi.org/10.1007/s11257-017-9195-0

Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, *3*(2), 173–182. https://doi.org/10.1038/s41562-018-0506-1

Orben, A., Weinstein, N., & Przybylski, A. K. (2020). Only holistic and iterative change will fix digital technology research. *Psychological Inquiry*, *31*(3), 235–241. https://doi.org/10.1080/1047840X.2020.1820221

Pariser, E. (2011). *The filter bubble: What the Internet is hiding from you*. Penguin.

Park, S. Y., & Kaneshiro, B. (2021). Social music curation that works: Insights from successful collaborative playlists. *Proceedings of the ACM on Human-Computer Interaction*, *5*(CSCW1), 1–27. https://doi.org/10.1145/3449191

Pelletier, L. G., Dion, S., Tuson, K., & Green-Demers, I. (1999). Why do people fail to adopt environmental protective behaviors? Toward a taxonomy of environmental amotivation. *Journal of Applied Social Psychology*, *29*(12), 2481-2504. https://doi.org/10.1111/j.1559-1816.1999.tb00122.x.

Peters, D., Calvo, R. A., & Ryan, R. M. (2018). Designing for motivation, engagement and wellbeing in digital experience. *Frontiers in Psychology*, *9*, 797. https://doi.org/10.3389/fpsyg.2018.00797

Pew Research Center (2020, February 6). The virtues and downsides of online dating [Report]. https://www.pewresearch.org/internet/2020/02/06/the-virtues-and-downsides-of-online-dating/

Powers, E. (2017). My news feed is filtered? Awareness of news personalization among college students. *Digital Journalism*, *5*(10), 1315–1335. https://doi.org/10.1080/21670811.2017.1286943

Prey, R. (2016). Musica Analytica: The datafication of listening. In R. Nowak & A. Whelan (Eds.), *Networked music cultures: Contemporary approaches, emerging issues* (pp. 31–48). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-58290-4_3

Prey, R. (2018). Nothing personal: Algorithmic individuation on music streaming platforms. *Media, Culture & Society*, *40*(7), 1086–1100. https://doi.org/10.1177/0163443717745147

Prey, R. (2019). Knowing me, knowing you: Datafication on music streaming platforms. In M. Ahlers, L. Grünewald-Schukalla, M. Lücke, & M. Rauch (Eds.), *Big Data und Musik: Jahrbuch für Musikwirtschafts- und Musikkulturforschung 1/2018* (pp. 9–21). Springer. https://doi.org/10.1007/978-3-658-21220-9_2

Prey, R. (2020). Locating power in platformization: Music streaming playlists and curatorial power. *Social Media + Society*, *6*(2), 1-11. https://doi.org/10.1177/2056305120933291.

Pronk, T. M., & Denissen, J. J. (2020). A rejection mind-set: Choice overload in online dating. *Social Psychological and Personality Science*, *11*(3), 388–396. https://doi.org/10.1177/1948550619866189

Quattrociocchi, W., Scala, A., & Sunstein, C. R. (2016). *Echo chambers on Facebook*. Discussion Paper No. 877. Harvard Law School. http://dx.doi.org/10.2139/ssrn.2795110

Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology*, *84*(6), 1236–1256. https://doi.org/10.1037/0022-3514.84.6.1236

Rosenfeld, M. J., & Thomas, R. J. (2012). Searching for a mate: The rise of the Internet as a social intermediary. *American Sociological Review*, *77*(4), 523–547. https://doi.org/10.1177/0003122412448050

Rosenfeld, M. J., Thomas, R. J., & Hausen, S. (2019). Disintermediating your friends: How online dating in the United States displaces other ways of meeting. *Proceedings of the National Academy of Sciences*, *116*(36), 17753–17758. https://doi.org/10.1073/pnas.1908630116

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, *52*(1), 141–166. https://doi.org/10.1146/annurev.psych.52.1.141

Ryan, R. M., & Deci, E. L. (2008). From ego depletion to vitality: Theory and findings concerning the facilitation of energy available to the self. *Social and Personality Psychology Compass*, *2*(2), 702-717. https://doi.org/10.1111/j.1751-9004.2008.00098.x.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.

Ryan, R. M., Deci, E. L., Grolnick, W. S., & La Guardia, J. G. (2006). The significance of autonomy and autonomy support in psychological development and psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Theory and methods* (pp. 795–849). Wiley. https://doi.org/10.1002/9780470939383.ch20

Salonen, V., & Karjaluoto, H. (2016). Web personalization: The state of the art and future avenues for research and practice. *Telematics and Informatics*, *33*(4), 1088–1104. https://doi.org/10.1016/j.tele.2016.03.004

Schedl, M., Knees, P., McFee, B., Bogdanov, D., & Kaminskas, M. (2015). Music recommender systems. In F. Ricci, L. Rokach, & B. Shapira (Eds.), *Recommender systems handbook* (pp. 453–492). Springer. https://doi.org/10.1007/978-1-4899-7637-6_13

Schwartz, P. (2006). *Finding your perfect match*. Penguin Group.

Serino, C. M., Furner, C. P., & Smatt, C. (2005). Making it personal: How personalization affects trust over time. Proceedings of the 38th Annual Hawaii International Conference on System Sciences, Washington, DC, 3–6 January, 2005, (pp. 170). https://doi.org/10.1109/HICSS.2005.398

Spanakis, E. G., Santana, S., Ben-David, B., Marias, K., & Tziraki, C. (2014). Persuasive technology for healthy aging and wellbeing. 4th International Conference on Wireless Mobile Communication and Healthcare, Athens, Greece, 3–5 November, 2014 (pp. 23). http://dx.doi.org/10.4108/icst.mobihealth.2014.257499

Sullivan, E., Bountouridis, D., Harambam, J., Najafian, S., Loecherbach, F., Makhortykh, M., Kelen, D., Wilkinson, D., Graus, D., & Tintarev, N. (2019). Reading news with a purpose: Explaining user profiles for self-actualization. Adjunct Publication of the 27th Conference on User Modeling, Adaptation and Personalization, Larnaca, Cyprus, 9–12 June, 2019 (pp. 241–245). https://doi.org/10.1145/3314183.3323456

Sumter, S. R., Vandenbosch, L., & Ligtenberg, L. (2017). Love me Tinder: Untangling emerging adults' motivations for using the dating application Tinder. *Telematics and Informatics*, *34*(1), 67–78. https://doi.org/10.1016/j.tele.2016.04.009

Sun, H. (2019). Paradox of celestial jukebox: Resurgence of market control. *Creative Industries Journal*, *12*(1), 105–124. https://doi.org/10.1080/17510694.2018.1554944

Sundar, S. S. (2020). Rise of machine agency: A framework for studying the psychology of human–AI interaction (HAII). *Journal of Computer-Mediated Communication*, *25*(1), 74–88. https://doi.org/10.1093/jcmc/zmz026

Sundar, S. S., & Marathe, S. S. (2010). Personalization versus customization: The importance of agency, privacy, and power usage. *Human Communication Research*, *36*(3), 298–322. https://doi.org/10.1111/j.1468-2958.2010.01377.x

Sunstein, C. R. (2009). *Republic.com 2.0*. Princeton University Press.

Swart, J. (2021). Experiencing algorithms: How young people understand, feel about, and engage with algorithmic news

selection on social media. *Social Media + Society*, *7*(2), 1–11. https://doi.org/10.1177/20563051211008828

Taddeo, M., & Floridi, L. (2018). How AI can be a force for good. *Science*, *361*(6404), 751–752. https://doi.org/10.1126/science.aat5991

Tetzlaff, L., Schmiedek, F., & Brod, G. (2021). Developing personalized education: A dynamic framework. *Educational Psychology Review*, *33*(3), 863–882. https://doi.org/10.1007/s10648-020-09570-w.

Thurman, N., & Schifferes, S. (2012). The future of personalization at news websites: Lessons from a longitudinal study. *Journalism Studies*, *13*(5-6), 775–790. https://doi.org/10.1080/1461670X.2012.664341

Tong, S. T., Hancock, J. T., & Slatcher, R. B. (2016). Online dating system design and relational decision making: Choice, algorithms, and control. *Personal Relationships*, *23*(4), 645–662. https://doi.org/10.1111/pere.12158

Treiblmaier, H., & Pollach, I. (2007). Users' perceptions of benefits and costs of personalization. ICIS 2007 Proceedings, Melbourne, Qld, 11–13 July 2007. https://aisel.aisnet.org/icis2007/141

Twenge, J. M. (2019). More time on technology, less happiness? Associations between digital-media use and psychological well-being. *Current Directions in Psychological Science*, *28*(4), 372–379. https://doi.org/10.1177/0963721419838244

Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2018). Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. *Clinical Psychological Science*, *6*(1), 3–17. https://doi.org/10.1177/2167702617723376

van de Wiele, C., & Tong, S. T. (2014). Breaking boundaries: The uses & gratifications of Grindr. Proceedings of the 2014 ACM international joint conference on pervasive and ubiquitous computing, Seattle, WA, 13–17 September 2014. https://doi.org/10.1145/2632048.2636070

Voigt, K.-I., Buliga, O., & Michl, K. (2017). Passion for music: The case of Spotify. In K.-I. Voigt, O. Buliga, & K. Michl (Eds.), *Business model pioneers* (pp. 143–155). Springer. https://doi.org/10.1007/978-3-319-38845-8_12

Walrave, M., Poels, K., Antheunis, M. L., Van den Broeck, E., & van Noort, G. (2018). Like or dislike? Adolescents' responses to personalized social network site advertising. *Journal of Marketing Communications*, *24*(6), 599–616. https://doi.org/10.1080/13527266.2016.1182938

Warren, N. C. (2002). *Date... Or soul mate? How to know if someone is worth pursuing in two dates or less*. Nelson Books.

Webster, J. (2021). The promise of personalisation: Exploring how music streaming platforms are shaping the performance of class identities and distinction. *New Media & Society*, 146144482110278. Advance online publication. https://doi.org/10.1177/14614448211027863

Wu, P., & Chiou, W. (2009). More options leads to more searching and worse choices in finding partners for romantic relationships online: An experimental study. *CyberPsychology & Behavior*, *12*(3), 315–318. https://doi.org/10.1089/cpb.2008.0182

Yampolskiy, R. V. (2020). Unexplainability and incomprehensibility of AI. *Journal of Artificial Intelligence and Consciousness*, *7*(2), 277–291. https://doi.org/10.1142/S2705078520500150

Yang, M., & Chiou, W. (2010). Looking online for the best romantic partner reduces decision quality: The moderating role of choicemaking strategies. *Cybersychology, Behavior, and Social Networking*, *13*(2), 207–210. https://doi.org/10.1089/cyber.2009.0208

Zhu, D., & Lee, S. (2020). Autonomous readers: The impact of news customisation on audiences' psychological and behavioural outcomes. *Communication Research and Practice*, *6*(2), 125–142. https://doi.org/10.1080/22041451.2019.1644586

Zytko, D., Grandhi, S., & Jones, Q. (2018). The (un)enjoyable user experience of online dating systems. In M. Blythe & A. Monk (Eds.), *Funology 2. Human–computer interaction series* (pp. 61–75). Springer. https://doi.org/10.1007/978-3-319-68213-6_5