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Sex tech, sexual data and materiality

Rebecca Saunders

In its consummate materiality, the sexual body is vital to the current discourse in digital health studies, disability studies and critical, feminist and postcolonial data studies, and broader theoretical trends in new materialism that insist on the embodied status of data production. This sexual body is a vital element in understanding the materiality at the heart of data production. This article explores how datafication becomes inscribed into sexual culture, influencing norms and expectations of sexual behaviours and culturally dominant ways in which the body is conceptualized. The article considers Pornhub, the AI RealDoll, two smart sex toys and a number of dating, intimacy and sex tracking apps, in order to explore the increasingly significant relationship between sex and data. This article considers the datafication of culture to describe the pervasion into culture of imperatives of quantification and categorization and binary and definitive epistemologies. The rhetoric, aesthetics, design and affordances of datafying technologies, and users' engagement with the data are considered here in relation to their impact on contemporary sexual culture.

The development of online pornography and 'sex tech' (Nixon and Scarcelli 2023, 293) heralds the growing significance of data cultures to contemporary sexual culture in the digital North. The rituals, practices and sensations of sex are changing through their relation to data-generative devices, platforms, networks and apps. The orgasming, loving and physical body is now connected to datafication processes: through dating apps, smart sex toys, sex tracking apps, intimacy apps and so on. Bringing devices into people's sexual relationships and often literally inside their bodies typifies the establishment of a profoundly material and psychological intimacy between people and digital devices. The creation and valorization of sexual data, a type of '[intimate] body data' (Sanders 2017, 37; Lyon 2003, 4), describes data that are gathered from sexual activity, feelings, sensations and relationships. The relationship between the sexual body and data at once clarifies the material basis of the 'digital data economy' (Lupton 2018, 6) and the dialectic impact of datafication on the sexual body. The ways in which the sexual body is a vital new site of data production is key to understanding the formation of dominant contemporary sexual culture.

This article explores how datafication becomes inscribed into sexual culture, influencing norms and expectations of sexual behaviours and culturally dominant ways in which the body

is conceptualized. The article considers Pornhub, the AI RealDoll, two smart sex toys – the Lioness vibrator and the soon to be released i.con ‘condom’ – and a number of dating, intimacy and sex tracking apps, in order to explore the increasingly significant relationship between sex and data. Datafication here refers to the production of numbers and statistics and to the ways datafication processes change how social phenomena are conceptualized. Kath Albury et al. refer to ‘the datafication of culture’ (2017, 2), where the ‘logic’ of data science and algorithms pervade various forms of sociality. Relatedly, this article considers the datafication of culture to describe the pervasion into culture of imperatives of quantification and categorization and binary and definitive epistemologies. Albury et al.’s concept of the ‘cultures of use’ (Race et al. 2017, 2) around data is also relevant here. They define this as ‘how data structures and processes are encountered, experienced, exploited and resisted by users who encounter them in the practice of everyday life’ (Albury et al. 2017, 2). The rhetoric, aesthetics, design and affordances of datafying technologies, and users’ engagement with data, are considered here in relation to their impact on contemporary sexual culture.

In its consummate materiality, the sexual body is vital to the current discourse in digital health studies, disability studies and critical, feminist and postcolonial data studies, and broader theoretical trends in new materialism that insist on the embodied status of data production (Coole and Frost 2010; Noble 2018; Ajana 2021; Mitchell, Antebi, and Snyder 2019): that is, the necessity of foregrounding the classed, gendered, racialized and nationalized lived realities of the people from whom data are extracted. The sexual body is a vital element in understanding the materiality at the heart of data production and, relatedly, the ways datafication shapes bodies on a material level. Just as Kate Crawford and colleagues assert that ‘wearable self-tracking devices’ are ‘representative of a revolution in how individuals understand their own bodies’ (Crawford, Lingel, and Karppi 2015, 480), so the ways in which the sexual body is connected to big data and smart technologies has significant impacts on the development of contemporary sexual culture. The growing relationship between the sexual body and datafication changes the way people articulate and understand what sex is and how to meaningfully relate to other people. Data become interpolated into the sexual body, and desire and relationships become connected to new, datalogical ways of knowing and subjectivatization.

The materiality of sexual data

The blending of data and flesh has been considered in interdisciplinary contexts such as science and technology studies, sociology and digital aesthetics. Irma van der Ploeg describes the ontological transformation of the body as it is blended with data, asking ‘how do we maintain the distinction between the body itself and information about that body, if the body itself, in a way, now consists of information?’ (2012, 180). Mary Flanagan describes the ‘new form’ of information as ‘virtual and organic flesh’ (2012, 16), and Patricia Clough describes in relation to affect ‘a biopolitics that works at the molecular level of bodies, at the informational substrate of matter’ (2007, 19). The sexual body has a history of a hyperbolic materiality, freighted with danger, taboo and a concomitant need for religious and judicial regulation. This history of the sexual body as profoundly and overly subscribed with materiality renders its

contemporary relationship to data a particularly important one in understanding the relationship between data and embodiment. The relationship between data and human 'matter' is typified by sexual data, where data are drawn from the wet muscle walls, open orifices, thrusts and ejaculate of bodies. Often, these data are produced by inserting devices into the body itself. The physicality of the sexual body, its wetness, hardness, orgasms, hormones and so on, become datagenerative phenomena.

Online pornography is the most culturally and economically prominent way in which the materiality of sexual desire and pleasure is rendered directly productive of data (Keilty 2018; Saunders 2020). In the users' libidinated porn searches, masturbation and orgasm produce the data that are vital to the platform economics of major porn conglomerates like MindGeek and Vivid Entertainment; to informing film production; and to embedding porn consumption in broader networks of dataveillance connected to other tech, apparel, news and non-adult media entertainment industries (Saunders 2020, 57–93). The world's largest online source of pornography, the Pornhub network, describes how it 'learns how you use our Websites [...] and interact with our content and advertisements [...] track[ing] users across different websites and over time' with cookies and 'other tracking technologies' (Pornhub Privacy, n.d.). It 'monitor[s] aggregate metrics such as total number of visitors, pages viewed, demographic patterns' (Pornhub Privacy, n.d.), the types of operating systems, browsers and devices people use, and so on, and shares these data with corporations, third-party advertisers and content providers. Pornhub Insights is part of the network and makes explicit the ways data are created out of the physicality of the aroused, masturbating and orgasming body. Its regular statistical posts chart the impact of events like elections, football matches, COVID-19 and Christmas on when people masturbate; masturbation times by country; the connection between speed of orgasm and internet connectivity quality; and so on. Rebecca Holt's description of edging as 'an engine for data production' (2020, 126) speaks to the way the physical sensations of pleasure and the drive to come are a potent means to establish and maintain contact between people's genitals and platforms and devices that function to gather data and monitor user behaviour.

The recent development of smart sex toys renders the extraction of data from the physicality of sexual sensations more direct. The two smart sex toys currently on the market – the Lioness dildo and vibrator founded by philosophy and art graduate Liz Klinger, and the i.con 'condom' made by the British Condoms company – produce data about sexual pleasure and behaviour during sexual activity itself. Biosensors on the tip of the Lioness dildo start collecting data on cervix dilation and muscle contractions when a temperature increase indicates that the dildo has been inserted into a body. The i.con is a plastic ring placed around the base of the penis. Its biosensors measure the movements and average temperature of the penetrating penis and produce information regarding calories burned during sex, number and velocity of thrusts and the different positions the wearer has performed (Hooper 2017). Through these smart devices, the materiality of thrusting, coming and the contraction and relaxation of vaginal muscles – the Lioness advertises itself as solely for vaginal, not anal, use – become flows of data out of the body. Orgasm becomes refigured as a paroxysm of data expulsion, as well as an objective around which other activities which have also become data generative, such as masturbation and sexual interaction, revolve. Aligned with wearable

devices like smart watches and fitness trackers, these objects utilize culturally prevalent notions of captured data, where data are conceptualized as being drawn directly from the body and therefore as objective and true. Smart sex toys posit their data as offering facts about the sexual body, an incontrovertible way of measuring and knowing physical aspects of sexual interaction and pleasure.

Realbotix's RealDoll, as the first sex doll with AI software – what it calls its 'AI driven robotic doll system' (Harmony^x) – similarly aligns the physicality of sex with data. The doll has an uncompromising, sexualized 'thingness'. On the dedicated online space for RealDoll customers, the Doll Forum, users post photographs of their doll(s) posed around the house as if alive. One user talks about being so moved at the realness of the doll on its arrival that he got into the crate to embrace it. The physical realities of having sex with the dolls are foregrounded often, with queries on the website and forum about tackling mildew; whether the animatronic robotic head can be penetrated; and references to the 'Sense^x vaginal insert' being removable so it can be rinsed off (Support). One user, Brett Dollbanger, posts frequent videos of himself having sex with the dolls that emphasizes their profound materiality. He can be seen smearing their rigid breasts with lube and sliding his penis in and out of the rubber vagina, the Bluetooth chip fitted inside it also 'simulat[ing] the gradual transition from mild arousal to orgasm' (Upgrade Your Experience) in conjunction with penetrative movement so that the doll moans and screams. The corporeality of the sexual act and the doll itself is closely aligned with its data-gathering capacity, which functions to develop and finesse the human verisimilitude of the product. While its animatronic head whirs with blinks and smiles, it 'listens' to its user speak so that it can regurgitate relevant information back to the user during conversation. The company also intends to aggregate the dialogue trees that emerge between dolls and their individual users, so that the dolls accrue an increasingly extensive bank of communicable 'knowledge'. The libidinalized feeding of data into the doll in the form of speech is central to the company's promise of offering a sexual interaction that has emotional depth and significance, where, as the creator Matt McCullen articulates the company's goal, 'You could come home and have kind of a bad day and talk to her and she'll make you laugh and you'll feel better' (Interview with Harmony). In publicized conversations between McCullen and the doll on YouTube, the doll's ability to 'remember' his tastes in food, music and so on approximates companionship, as do occasional moments where it seems she genuinely understands. In one video, McCullen asks 'How big are your boobs?' and 'she' responds 'You have eyes'. All the men in the room laugh appreciatively. The possibilities of ostensible communication made possible by the doll's data gathering and AI is central to the sexual experience it offers. RealDoll demonstrates that data are drawn not only from the corporeality of sex but from the interrelated psychological aspects of sex; the deep emotions bound up with sex and the need for love and intimacy become connected to the doll's datainfused identity. As McCullen explains, the communicative capacity of the doll 'is about the mental and emotional interactions that we have with each other [...] She'll ask you questions. She'll remember your hopes and dreams' (Bill 2021, Saunders 2022).

Sex tracking and intimacy apps similarly produce data from the intertwined physical and affective aspects of sex. Apps like Nice, Sex Tracker and Sex Keeper, all available within Apple's suite of health-related apps, require users to manually input information about where they

had sex, how long it lasted, what positions they used, key features of sexual partner(s) and so on, which is then re-presented on the app through various data visualizations to allow users to notice patterns regarding, for example, which partners generate the most orgasms and which days of the week produce the longest sexual 'sessions'. Other apps like Emjoy, Coral and Spicer ask users to manually input detailed information about their sexual memories, unexplored fantasies, insecurities, history of sexual trauma and abuse, and so on. The gathering of more qualitative, psychological information is used to offer users courses through the app on how to facilitate better connections and sex with a partner; train their bodies to experience greater pleasure; learn new sexual positions; and overcome sexual trauma or relationship boredom through therapeutic diarising. User engagement with the apps generates sexual data – that is, data about their sexual lives. It also uses sexual feelings and relationships as a means to produce data about digital usage – that is, data about how, when and for how long a user interacts with an app, their operating system, their device and so on – that are valorized in relation to personalized advertising, marketing and finessing of digital services. The Emjoy app, for example, promises women a way to '[b]oost your libido, climax more consistently [...] [and] improve your relationships' (Emjoy). It cycles both aggregated information about female pleasure and desire input by users, and data about digital user behaviour through third-party advertising and analytic companies such as Facebook Ads and Facebook Analytics for Apps, Google Ad Manager and Hotjar Heat Maps (Privacy Policy of Emjoy). Coral, another app which encourages female users to 'consciously create your best sex life' (Coral), circulates to third-party advertisers and social networks both data gathered about users' app behaviour from web beacons and cookies, and sexual data manually input by the users themselves (Coral Privacy Policy). Sexual subjectivity becomes an important basis through which app and digital device engagement is better understood.

In online pornography, sex tracking apps, smart sex toys and AI sex dolls, what Morar and Gracieuse call the 'enormous flow' (2016, 233) of desire literally becomes an 'information flow' (Flanagan 2012, 16). Pleasure, orgasms, bodily fluids, blood, cramps, intimacy and trauma become physical and psychological phenomena around which both sexual and user data are created, as data flow out of the body in the form of love, intimacy, bodily fluids and muscle spasms.

Ingesting sexual data

Sexual relationships and experiences also become important areas in which people are expected to consume data about themselves, exhibiting the same reflexive dataveillance well established in the culture of health-tracking wearable devices. Deborah Lupton's consumptive metaphor regarding the twenty-first-century quantified individual, that they are a 'data-eating [and] emitting subject' (2016, 4), is epitomized in sex tech. Data are propelled from the thrusting, orgasming body and consumed by its users, who are asked to 'ingest' (2016, 4) their sexual data.

Pornhub Insights encourages porn consumers to understand their desires, as they are expressed and shaped through watching porn, in statistical form. Understanding one's sexuality and desire through statistics becomes important. Wendy Chun (2006, 75) describes

how people locate the relative deviancy or normalcy of their desires within statistics. In *Bodies of Work* I relate this specifically to Pornhub's data visualizations, where '[s]hameful desires may be validated through a reassuring informational belonging or a pleasing sense of uniqueness asserted through one's lack of adherence to popular tastes' (Saunders 2020, 62). Users also critique the validity of certain findings in relation to their own sexuality. Multiple female users complain, for example, that Pornhub's segregation of data collection between straight and male gay searches erases the popularity of male gay pornography for straight female viewers: these parameters of datafication produce 'biased stats [...] blatant misrepresentation being sold as valid, unbiased information' (Bishy 2019).

Sex tracking apps promise users greater sexual fulfilment and intimacy through engaging with the quantification of their sexual subjectivity and behaviour. The intimacy app Love Nudge, for example, quantifies behaviour in a relationship in relation to each partner's love language. Actions like 'Hold Hands' and 'Ask About His Day' become goals to set and meet in order to 'fill each other's love tanks' (Chaney 2022). How well one regularly achieves these goals is represented in slowly filling pie charts with breakdowns like 33% Quality Time, 27% Words of Affirmation, 27% Acts of Service, 10% Receiving Gifts, 3% Physical Touch (Love Nudge). This quantification is described as a 'tool that helps couples experience love more deeply' (Love Nudge).

People's ingestion of their sexual data and their conceptualization of sexual relationships in datafied terms shape sexual subjectivity. Data and data practices are brought into the heart of sexual experiences and relationships. These apps require a lot of reflection on one's sexual experiences, within often strictly categorized parameters. There is an expectation too of a fairly immediate engagement with quantification after a sexual act or even just a thought has taken place. Enjoy asks users, for example, to note in the app's diary all the arousing thoughts they have throughout a day and what triggers them – a piece of music, a scene from a television show, a memory and so on. The EiNano app, which tracks people's masturbation habits, asks users to enter the date they masturbated, the time of day, whether they consumed pornography, whether a toy was used, whether they came, whether a soundtrack played and any special notes (EiNano). The expectation is clear that transmuting sexual thoughts and sensations into data needs to be a regular practice. On the Lioness app, the data visualizations produced are available immediately after the user has come or finished their 'session' (Lioness Privacy Policy, n.d.), suggesting that users will want to read their sexual data as soon as possible in order to make sense of their experience. A 'live view' feature is also offered where users can watch the data about their muscle contractions being generated in real time as they use the toy. Engaging with data becomes part of and completes the meaning of sexual acts. Transforming sexual sensations and feelings into data and having datafying devices as a mediator and intimate constant in relationships becomes a normative and even necessary aspect of sex. Data are brought literally inside the sexual body and into the most intimate conversations and sexual interactions. Data become a vital lens through which people understand and conceptualize their sexual experiences and sensations.

Sexual pleasure and relationships therefore become inflected everywhere with types of 'data practise' (Lupton 2014, 13): with the upkeep, reading, parsing, production, interpretation and analysis of data and with a profound subjective engagement with lists,

categories and rankings. How people experience and conceptualize pleasure and intimacy become bound up with data; data become thoroughly integrated into the material and experiential phenomenology of desire, pleasure and intimacy.

In a digital society that reveres data, sexual data are valued not only strategically on the basis of the new, scientific insights they provide, but as an almost mystical good in itself. The fact of engaging in datafying processes and the concomitant output of data visualizations and statistics are enough in themselves to justify the time spent inputting facts and reading graphs about one's sexual behaviour. EiNano presents users, for example, with a line graph it calls the user's 'Biorhythm', which visually charts the number of times the user masturbated each day of the week. There is also a bar chart divided into days of the week which shows the same information and pictographs representing, again, the most common times of day the user masturbated, and their longest and shortest 'session' times. There is no analysis of what this statistical transformation might reveal; the significance of any patterns is not specified. It is simply the quantification itself which is understood to be inherently valuable to users. In user reviews for Lioness, data are similarly valued for their own sake: 'Love the data so much' (Christina 2021) says one user; 'data nerds, rejoice!' (Stormy 2021) exclaims another. Conferring affluence, intelligence and technological sophistication, the data themselves become what datafication discovers and what is valued by users. Mark Andrejevic, Alison Hearn and Helen Kennedy's concept of 'metadatafication' (2015, 381) is relevant here: the 'message' of the data is itself. Through these varied examples of sex tech, data become an essential component of 'good' sex, and meaningful and significant simply in their status as data.

The AI capabilities of the RealDoll that are central to its brand also involve the pleasure of interacting with data for its own sake. The doll is an erotic materialization of datafication: the quality of the sexual interaction and its approximation to interacting with a real person revolves around the efficacy of the machine's data learning. Its pleasure lies, as McCullen states, in the ability it affords to 'communicate with technology through a doll' (Interview with Harmony). The central thrall of the doll is its ongoing, eroticized relationship with data, as users feed data in, enjoy the ways in which its regurgitated and manage the doll's various quantified personality aspects and responses via the app. The sense of companionship the product tries to provide is really a relationship with data itself.

Where data are seen as directly expressive of, even synonymous with, sexual pleasure and orgasm, the data themselves attain a libidinal quality. Sex tech explicitly libidinizes what Shoshana Magnet calls the 'surveillant scopophilia' (2011, 17) of digital tracking technologies, as data practices and quantification are stitched into sexual experiences. As one Lioness user states: 'The data is really cool, I've never ever seen data about myself in this way and it's got me thinking a lot about myself in a way i never did before' (steph 2021). Part of the pleasure of sex lies in seeing one's sexual self through data. The thorough intertwining of data (practices) with masturbation, romance, connection, sex and orgasm sees data accrue powerful associations with pleasure. The process of generating and engaging with data about one's sexual experiences becomes part of the pleasure of sex, in the same way that Carolina and Arturo Bandinelli describe dating apps as becoming 'libidinal objects in their own right'. Just as apps 'emerge as objects producing forms of affective attachment in and for themselves

[...] the primary function is not that of enabling an embodied encounter but of producing a libidinal attachment to the process of looking for one' (Bandinelli and Bandinelli 2021, 182–183 and 190–191) Likewise, through sex tech, data become suffused in themselves with arousal.

Where 'captured' sexual data are seen as synonymous with the body and sexual affect itself, data become not just the sign of pleasure but a form of pleasure. Where data are understood as a means of reading the truth of the body as it experiences pleasure, data are sex; the data visualizations and numbers are the experience. Data are both a sign and a means of more sexual fulfilment, pleasure and self-knowledge, and are that sexual and romantic fulfilment itself. What Morar and Gracieuse, drawing on Foucault, describe as the goal of sexual discourse becomes true of data: 'to make him visible, to implant in his body a principle of intelligibility, and to make him ultimately an individual whose identity, whose total composition, was entirely saturated by his sexuality' (Morar and Gracieuse 2016, 236). The varied forms of sex tech considered in this article demonstrate a necessity to express sex through data and a saturation of sexual discourse with discourse around the importance and value of data. The incitement to speak sex through data and to turn sexual sensations and feelings into data intensifies the cultural discourse of both sex and datafication. Foucault's description of the incitement to sexual discourse in eighteenth and nineteenth-century Europe – 'you will seek to transform your desire, your every desire, into discourse' (1978, 21) – continues contemporarily and becomes linked to the incitement to produce data. The sexual discourse that defines the twenty-first century, then, is one in which data must be central. Data are an inherent good. Datafying technologies must be embedded into the sexual body. Data practices must be interpolated into sexual relationships and subjectivities, and producing data must become a central objective of sex.

Where the generation of more data becomes a sign of more pleasure, data and the search for love, intimacy and pleasure exist in a reciprocally expansive relationship. Where data are both an expression in themselves of sexual pleasure and promise to expand the capacities of one's sexualness and foster better sex and relationships, a cultural imperative develops to generate more data in relation to a parallel imperative to find greater sexual fulfilment and pleasure (Wilkes 2015; Banet-Weiser, Gill, and Rottenberg 2020; Scharff and Gill 2011; McRobbie 2004). A cultural incitement to be sexual becomes linked to a reciprocal incitement to generate data, and to show and experience sex through data. It becomes thoroughly normative for people to relate to their own bodies and make sense of their sexual experiences through data, with engagement with datafying devices indexing in itself pleasure and fulfilment. More sex generates more data, and more data are understood as a sign of maximum sexualness and as a (sexual) good in itself. The relationship between sexual culture and data cultures is therefore one which intensifies both a discourse around sex – its importance, the necessity of working on one's sexual self, the need to procure the best partners, to learn new techniques and so on – and a sexual discourse saturated with data.

Sexual culture and data culture

We can begin to analyse the impact of the centrality of data on contemporary sexual culture in terms of the inculcation of norms (Anderson 2012, 32). Establishing data (practices) and dataveillance as a normative and necessary part of sexual subjectivity and relationships is part of a broader inculcation of the constant checking and monitoring of devices as invisibly normative, necessary and as unnoticed as breathing. Smart phones are likely the last thing people touch before they fall asleep and the first thing they touch on waking, facing us on the pillow like a modern-day Lautrec's *The Bed*. Kanye West tweeted about the steroid injections he needed in his hands from the pain of 'too much texting' (Natfulin 2020). Systematizing a maximum 'sensuo-perceptual contact' (Beller 2006, 6) with devices is vital to the economics of big data, and desire – for love, sex, pleasure, companionship – is a powerful means to establish that contact. The uncritical, all-encompassing normativity of data itself is established, as vital to managing sexual relationships and understanding one's sexual self. Central aspects of data culture – (numerical) rationality, definitiveness and objectivity – diffuse into contemporary sexual culture.

Our relationships with our digital devices are profoundly intimate and the extent to which they are embroidered into the tapestry of life sees them significantly influence material and behavioural ontology. Esmeralda Kosmatopoulos' sculptural installation *Fifteen Pairs of Mouths*, which features plaster casts of hands in various phone-holding postures, variously cradling, grasping and entreating, shows the material changes wrought in the body through their intimate relationship with devices. Our bodies and psyches grow into and through these objects, so continual and intrinsic is their use. Kosmatopoulos' hands are suggestive too of the way we tend to phones, and the apps and data within them, like lovers, checking in, physically stroking their screens and attending to their requests. Bandinelli and Bandinelli gesture towards this libidinal relationship and the neediness of tech, saying of dating apps that 'It wants us. It wants us to be there [...] to have you touching it, enjoying it' (2021, 183 and 191). Dating apps, sex tracking apps, online porn, smart sex toys and dolls all inculcate a ritualized, daily engagement with the aesthetics, language and practices of datafication. The profound intimacy and reciprocity of people's engagement with data changes the quality of desire and the way in which sexual embodiment and interaction are experienced and understood. The universalization of 'the language of numbers' and a new 'quantitative mentality' (Porter 1996, 118; Mau 2019; Vormbusch 2022) that Theodore Porter describes are interpolated into sexuality. Categorization and quantification have material effects on the sexual body (Saunders 2020, 97–101). Data's principles of rationality, fixity and numericism impact significantly on the materiality of sexual behaviour and on the way in which the value and meaning of sexual experiences and sensations are conceptualized. Locating datafication processes and practices in the heart of sexual embodiment, selfhood and interrelationality sees the culture of data – that is, the valorization of objectivity, numerical rationality and certainty – become central in mainstream sexual culture.

Intimacy, desire, pleasure and love are shifting, ambiguous and mercurial phenomena, possessing an indefinability that is anathema to the 'digital data economy' (Lupton 2018, 6). They typify those 'intangible "raw materials"' that derive from the 'relational, emotional and

cognitive faculties of human beings' valorized in post-Fordist capitalism, which are 'not immediately measurable in numeric terms [...] not determinable through objective units of measurement' (Morini and Fumagalli 2010, 235 and 248–249). Where a tension exists between how the sexual body is experienced and how it can be represented through data – Mary Flanagan quotes Donald Norman's description that 'Machines are mechanical, we are biological. Machines are rigid and require great precision and accuracy of control [...] We tolerate and produce huge amounts of ambiguity and uncertainty, very little precision and accuracy' (Norman 1998, 15) – it is the sexual subject who must fit love, desire and pleasure into the parameters of digital machines and their datafication processes. In order for the complexity of sexual interactions and the elusiveness of desire to be quantifiable, individuals must learn to conceptualize and define their sexual experiences according to logic of data.

This means that love, desire and pleasure must be felt to be measurable; as phenomena best conceptualized and understood numerically; and through practices and structures of rationality. The production of numerical rationality is everywhere apparent in sex tech, whether explicitly in the form of foregrounded quantification in data visualizations or in the tacit culture of datafication that requires people to engage with notions of rationalization through the aesthetics or language of lists, categories and hierarchies. Dating apps package people into discrete and knowable concepts and proffer potential partners and their suitability as measurable phenomena. A quantified approach to sexual relationships, whether in terms of the rationalized sifting through potential partners or the ways in which people are presented and conceptualized, has become a profoundly mainstream element of the 'love industries' (Bown 2022, 65) and culture. Three hundred million people use dating apps globally (Curry 2022) and their various ways of codifying people's fantasies and wishes – on Bumble, for example, into 'want children someday', 'looking for something casual', 'looking for a relationship' and so on – have a significant cultural impact. A quantifiable conceptualization of romance and love can often be seen pervading the free-form parts of dating apps too, with people bullet-pointing traits they are seeking and those that would lead to an immediate rejection. Partners become a collection of definitive traits and the measurability of people and love becomes well established. Sex tracking and intimacy apps similarly inflect sexual subjectivity and relationships with quantification and rationality. One reviewer of Sex Tracker asks whether an option could be added to sort partners by numbers of stars, and a 'count' option added to measure how many times you have had sex with a particular person. This would 'serve as a kind of warning that someone's getting a little out of hand or just a handy reference for the overall number' (Sex Tracker). Engaging with digital pornography's explicit codification of sexual visual media similarly fosters rationality within the sexual subject, as the ambiguity of desire is reduced to ever more specific searchable terms (Saunders 2020, 61). Patrick Keilty also writes about the way the algorithmic arrangement of porn content based on a user's previous searches produces a commensurately definable sexual identity: 'a logic of recognizable cues [...] regulat[ing] viewers' subject positions [...] creating an environment in which subjects and desires are produced as essential standards' (2017, 270). Interacting with the RealDoll similarly requires users to engage with quantified ideas of eroticism – one user describes his model as 'she is a 2.0 and she is a Body H' (Doll Forum). Users can also shape the doll's personality by choosing

from pre-programmed traits: combinations of affectionate, jealous, insecure, talkative, funny, spiritual, moody, intellectual and so on. The doll's responses are also controlled through the user's monitoring and influencing of its love, desire and social 'metres'. One user talks on the forum about learning how to interact most effectively with the doll's app, outlining ways of 'get[ting] a "quicky" in over lunch, when you might not have time to max out the "desire scale"' (Doll Forum). These measurable amounts of fulfilment and the notion of sexual sensations as calculable are similarly present in smart sex toys, which interpolate what Fahs and Swank call 'internal masturbation scripts' (2013, 675), with fixed 'categories' of desire and types of orgasm. Lioness aggregates data, for example, on the different patterns of muscle contraction and asks users to discover which of the three types of orgasm they have: avalanche, ocean or volcano (Orgasm Patterns). Users are encouraged to learn, through engaging with their data visualizations, what environmental factors – alcohol, marijuana, caffeine and so on – impact on their ability to come. These technologies assume consistent and linear modes of desire: in terms of how to motivate arousal and how it unfolds; what constitutes sexual activities; and how 'sexual' someone is as a person. Desire, pleasure, attraction and intimacy become inflected with quantification and become conceptualized as stable and definitive (numerical) states. While Fahs and Swank point out that 'women's physiological arousal does not always correlate with sexual desire (2013, 669), the Lioness offers unproblematic correlates between pleasure, orgasm and sexual fulfilment, and muscle contractions that can be easily represented on a graph. Bardzell and Bardzell describe in relation to designing the 2003 vibrator We-Vibe the need that 'human desire [be] analyzed into constituent parts' as a solvable 'design problem space' (2011, 262). Arousal and pleasure become understood as unproblematically numerical and linear, and sexual affect and relationships become conceptualized as things which can be best appreciated and experienced rationally and numerically. Sex tech fosters essentialism and disambiguity in mainstream sexual culture.

There is a pervasive rhetoric across these technologies that the objectivity afforded by datafication is a more helpful way of relating to one's sexual self. A neutral and objective view of one's sexual experiences is understood as offering a superior type of knowledge and understanding than is possible through subjective and embodied ways of relating to the body. The S*x Tracker Logger Calendar app, where coloured segments of a pie chart represent the different locations the user had sex or allow a quick comparison of the longevity of sexual encounters between different partners, promises to 'improve your sexual life by sexual statistics' (S*x Tracker Logger Calendar). The Sex Tracker app states:

Through the miracles of science and mathematics, the developer(s) of this app have been able to create a means for making accurate statistical analysis of our most intimate personal practices [...] Weekends work best for you? You will find out for sure! Ever thought you were always open to it on the evenings? Think again! Data doesn't lie, it's time to get your own facts straight! (Sex Tracker)

Lioness reports that 93% of users 'Had better orgasms and/or understood their body better' and '91% Said Lioness helped improve their relationships and had more fun' (We Made Revolutionary Technology Easy): 'Precision sensors let you literally see your arousal and

orgasm. Experiment, understand yourself, and have better orgasms – after all, as the saying goes, “never measured, never improved” (Orgasm Patterns). The capacity to transmute sexual experiences into numbers and then to relate to and perceive one’s self objectively through the app’s data visualizations is depicted as offering a superior form of self-knowledge. Intimacy apps like Cozi, Honeydue and Couple Game posit the datafication of positions, fantasies and fears as necessary to a fulfilling and committed sexual relationship and as superior to non-quantified modes of communication. Closeness and satisfaction in a relationship is understood as definitely producible and discoverable through static and predetermined behaviours. The objectivity of numbers is often described as providing a useful communicative go-between for couples, with reviews with the following sentiment common: ‘wife and I love it. it’s given her an opportunity to explore herself [...] and it’s brought us closer together as a couple’ (Drew n.d.).

Dating apps present the certainty of the algorithmic processing of data as the basis of a more fulfilling, more real compatibility. Logan Ury, ‘director of relationship science’ for Hinge, describes the Gale–Shapley algorithm used by the app as allowing people to ‘break that bad habit’ that sees them consistently choose the wrong type of partner; they ‘bridg[e] relationship, emotion, and behavioral science with user experience research, business intelligence analytics, and data science to unlock insights about love and dating’ (Hinge Labs). Data bypass the fallibility of decisions based in emotions (Baah 2020). Instead, the ‘love scientists’ in the ‘Hinge Labs’ (Hinge) forge through the objectivity of the algorithm a better love than is possible through subjective, human decision-making.

The sense that numerical objectivity fosters better sexual experiences and relationships, and provides more important insights into these interpersonal phenomena, draws on the strong culturo-economic notions of data as unproblematically factual and scientific (Boyd and Crawford 2012; Gitelman 2013; Mayer-Schoernberger and Cukier 2013; Lupton 2015, 446). The notion that it is precisely the objectivity and supposed neutrality of quantification in which greater understanding and fulfilment of the sexual self lies, marks an important shift in sexual culture. The bringing together of sexuality and data sees a normalization, valorization and internalization of sex as rational, knowable, numerical and definitive. In particular, the idea of ‘capturing’ information directly from bodies also conjures a sense of data as showing the unmediated reality of bodies, and therefore as offering a superior way of experiencing and engaging with sex than can be attained through embodied knowledge and experience of the sexual self.

Conclusion

Sexuality, desire and the body are social constructions. Morar and Gracieuse draw on Deleuze and Dan Smith’s respective constructivist explorations of desire when they state that ‘what we desire, what we invest our desire in, is a social formation [...] Desires are not our own.’ There is no ‘natural expression of desire, but a contingent, cultural organization of our desiring and productive forces’ (Morar and Gracieuse 2016, 233 and 239). Contemporary sexual culture is significantly forged through its deepening relationship with data. Our contemporary understandings of what sex is, how sexual sensations are experienced, what types of

relationships we should have and so on are produced through our relationships with datafying technologies like online pornography, sex toys, dating apps and sex robots. The relationship between sex and data changes the way desire, pleasure and the body itself are experienced, with sex tech also vital to understanding the centrality of the body to understanding the socio-cultural impact of big data and datafication cultures.

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