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From fighting animals to the biosocial mechanisms of the human mind: A comparison of Selten's social defeat and Mead's symbolic interaction

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Abstract

Social defeat is a psychiatric theory accounting for the role of social environment in the aetiology of psychosis via the mechanism of stress. Social defeat stems from animal studies of stress, whereby a small rat is introduced into a larger rat's cage and is subsequently attacked and defeated by its larger foe. The defeated rat is subjected to behavioural and hormonal analyses to explore its stress levels. The idea is that social defeat leads to *social stress* which may cause psychoses. In this article, we draw on the work of Jean-Paul Selten to critique the epistemics that are bound up with social defeat research. For comparative analysis, we use Mead's *Mind, Self and Society* to tease out the problems of social defeat and suggest potential remedies. We contend that, in seeking to equate animal and human sociality, social defeat portrays human interaction as hostile and pathological, and minority groups as inevitably defeated. In contrast, Mead's symbolic interaction presents human sociality as progressively organizational. Mead's account is grounded in human exceptionalism and lacking attention to structural inequalities. Nevertheless, symbolic interaction has much to offer contemporary social defeat research, albeit whilst echoing some of its *thin* sociology.

Keywords

biosocial, city, Mead, migration, psychosis, rodent model, Selten, social defeat, symbolic interaction, schizophrenia, urban

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Introduction

In this article, we contribute to contemporary literatures on the biosocial by analysing ‘social defeat’, an influential theory in psychiatric research linking social environment and schizophrenia. We suggest that another biosocial account of the mind, Mead’s (1934) outline of symbolic interaction in *Mind, Self and Society*, offers a productive comparator. While this comparison may seem idiosyncratic, both use fighting animals to develop implicit imaginings of human sociality and its psychological consequences that can be considered thinly sociological. Reading social defeat *alongside* Mead reveals radically different imaginings of the biosocial. This comparison exemplifies the opportunities for sociology to contribute to and learn from biosocial research into pressing social problems, responding to Newton’s (2016, p. 130) call for ‘reflexive, and in-depth, interrogation of existing social and life science assumption [*sic*]’.

In recent decades, psychiatric thought has shifted toward traditional sociological concerns. Where mental disorders were once deemed primarily biological and brain-based, the social environment is now attributed a greater role in the aetiology of various mental illnesses (Fitzgerald et al., 2016). This matters for sociology because the rise of the social environment as an aetiological variable is progressing with promise that can be better realized through sociological engagement (Callard & Fitzgerald, 2015). This shift is echoed in the biosocial turn in the social sciences, whereby the entanglement of the biological and the social is being revitalized by findings from epigenetics and related fields (Fitzgerald et al., 2016; Landecker & Panofsky, 2013; Meloni & Testa, 2014). Indeed, Rose (2013) suggests that sociology’s future relies on engagement with biology, while Timmermans and Haas (2008) have argued for a more physiology-embracing sociology of disease. To this end, Niewöhner (2011) has offered a notion of ‘customary biology’, grounded in observed regularities rather than laws, understanding biologies alongside habituated forms of everyday life.

Sociological interest in the biological has a substantial history (Meloni et al., 2016). In the early 20th century there was a rich engagement between sociological and psychiatric concerns, e.g. Faris and Dunham’s (1939) work on mental disorders in urban areas. They argued that cities – and the modes of social organization within them – could lead to the development of mental disorders (Fitzgerald et al., 2016). Thus, the relationship between cities and mental illness was a ‘foundational concern for sociology’, at a time when the borders between sociology and psychiatry were less solidified than they would be for much of the 20th century (Fitzgerald et al., 2016, p. 140). For Fitzgerald, Rose and Singh, sociologists must pay more attention to people’s embodied and biologic lives and the equally real historical, political and scientific attempts to understand, chart, and govern those lives as ‘matters of concern’ (Latour, 2004).

In this article, we contribute to the biosocial turn through analysing ‘social defeat’ as an influential way of conceptualizing, operationalizing and researching the biosocial genesis of mental illness. We focus on the notion of social defeat because, since its introduction in an editorial in 2005 (Selten & Cantor-Graae, 2005), it has become a popular means of accounting for relationships between urbanicity, ethnicity and psychoses in the psychiatric research literature. Social defeat is often used as a starting point for unifying various ‘exposures’ that correlate with risk of psychosis (e.g. Gevonden et al., 2014a, 2014b; van

Dam et al., 2012; Veling et al., 2007). Social defeat is also entering the social sciences. For example, Marrow and Luhrmann (2016, p. 197) have used social defeat to explain ‘the way that poverty, violence, and being on the wrong side of power drive us mad’. Social defeat’s purchase in biosocial psychiatry and penetration into social science warrants sociological analysis of the concept, and the imaginings of social life it generates.

In this article, we pursue said analysis by focusing on the foundational work of Jean-Paul Selten, a key figure in developing the social defeat hypothesis. A professor of psychiatry focusing on the epidemiology of schizophrenia, he is credited with the first attempt to develop a causative mechanism to explain various social environmental associations with schizophrenia (Selten et al., 2017). Our analysis is based on a critical reading of all of Selten’s publications focusing on ‘social defeat’. The substantive analysis we present here is especially focused upon the first two publications by Selten and collaborator, Cantor-Graae (Cantor-Graae & Selten, 2005; Selten & Cantor-Graae, 2005), cited around 1700 times, which make their hypothesis about social defeat explicit, as well as subsequent publications developing the hypothesis (e.g. Selten et al., 2013, 2016, 2017). We also conducted limited ‘snowball sampling’, critically reading numerous papers that apply Selten’s work on social defeat in various settings. This is not a formal literature review, nor do we purport to have read the exorbitant number of papers citing social defeat, nor do we suggest that social defeat is the only theory of the social currently inhabiting psychiatric research.

We focus on Selten’s work as a coherent, accessible and indicative means of interrogating conceptual issues that are evident in the broader tradition of social defeat (see Cantor-Graae & Selten, 2005; Selten & Cantor-Graae, 2005; Selten et al., 2013, 2019). Selten’s work is also an example of the kinds of syntheses of traditional sociological and biological concerns to which we speak, entangling biology and society to theorize human experience. Social defeat, we argue, is a form of ‘thin sociology’ – a sociological engagement at a superficial level. However, we will show that this very ‘thinness’ creates space for epistemological ‘entanglements’ and collaborations (Callard & Fitzgerald, 2015) because it imagines the social *alongside* the biological.

Rats and social defeat

Social defeat research has a long history, emerging from the broader 20th century tradition of using rats to model human behaviour (Ramsden, 2012). This is most commonly done with the resident–intruder paradigm (Björkqvist, 2001), where a smaller ‘intruder’ rat is put into the cage of a larger ‘resident’ rat.¹ In the optimal version of these experiments (see Koolhaas et al., 2013), a resident male rat is housed with a female companion to encourage it to establish a territory that it will defend. After several days, the female is removed from the cage and the intruder is introduced. The resident and intruder rats are then observed interacting for 10 minutes, during which a range of distinct behaviours are typically observed, e.g. the ‘clinch attack’ – where the resident mounts, bites and scratches the intruder. The actions of the fighting rats are typified into component behaviours, operationalization of sociality in terms of type, frequency and duration of behaviour. Social defeat refers to how these interactions result in one rat *losing* and the other *winning*, that is, asserting its dominance (Koolhaas et al., 2013).

While behavioural analyses are an important component of social defeat research, the tradition has historically been dominated by physiological analyses (Björkqvist, 2001). Throughout the 1990s, publications charted myriad molecular changes associated with social defeat in rats. When compared with control rats, socially defeated rats were shown to have impaired corticosterone response (Albeck et al., 1997), neurological development (Alleva & Aloe, 1989), dopaminergic response (Tidey & Miczek, 1997) and immunological function (Stefanski & Engler, 1999). Social defeat was also proposed as an animal model for mental disorders such as depression (Koolhaas et al., 1995). Behavioural changes in defeated rats were posited to be *depression-like*, resembling those in humans. While social defeat is still employed as an animal model for mental disorders (see Koolhaas et al., 1995 for critical discussion), the work by Selten and Cantor-Graae takes a different but important approach. They see social defeat not just as a way of modelling schizophrenia, but as being potentially implicated in the mechanisms of schizophrenia's onset.

In 2004, Selten and Cantor-Graae published a book chapter about schizophrenia and migration in which they hypothesized social defeat as an explanatory mechanism, followed by two influential papers in 2005: the previously mentioned editorial, and a review of the relations between schizophrenia and migration. The editorial begins by showing that schizophrenia is associated with urban upbringing, migration and low IQ. Selten and Cantor-Graae (2005, p. 101) suggest that these findings can be explained through social defeat because city life exposes them to social competition and potential 'outsider status'. Long-term social defeat, also termed 'subordinate position' or 'outsider status' (we return to this terminology below) is hypothesized as a bridging concept for explaining the association between being a migrant or a city-dweller (or both) and having an increased risk of developing schizophrenia. In short, their hypothesis is that 'a chronic and long-term experience of social defeat may lead to sensitisation of the mesolimbic dopamine system (and/or to increased baseline activity of this system) and thereby increase the risk of schizophrenia' (2005, p. 101).

Beginning with epidemiological studies showing increased schizophrenia risk for second-generation migrants and city-dwellers, social defeat is an attempt to formulate a mechanism for understanding the strong correlations between particular forms of life (in the city, as a migrant) and schizophrenia. Having initially noted that the mesolimbic dopamine system is sensitized in schizophrenia (2005, p. 102), Selten and Cantor-Graae argue that social defeat in rats has been shown to produce 'dopaminergic hyperactivity in the meso-corticolimbic system'. For them, this similarity is telling: 'If the results of animal experiments can be extended to humans, chronic exposure to social defeat may lead to sensitisation of the mesolimbic dopamine system and/or overactivity of this system, and thus further the development of psychosis' (2005, p. 102).

In their meta-review, published at the same time, Cantor-Graae and Selten (2005, p. 17) find 'a significant association of risk [for schizophrenia] with skin color. . . . The mean weighted relative risk for migrants from countries where the majority of the population was black was 4.8 (95% CI= 3.7-6.2), approximately two times greater than that for migrants from countries where the majority was white or nonwhite/nonblack.' They note that social defeat might explain these findings, because 'social defeat could arise whenever an individual is forced into a subordinate position in relation to a dominant

group' (Cantor-Graae & Selten, 2005, p. 21). The payoff of this supposition is that 'disturbed brain dopaminergic function resulting from long-term experiences of social defeat could provide a common pathogenetic mechanism for the increased risk for schizophrenia in urban residents and migrants' (Cantor-Graae & Selten, 2005, p. 21).

Selten's research has focused mainly on ethnicity (often operationalized in terms of 'lighter' or 'darker' skin colour, see e.g. Cantor-Graae & Selten, 2005, p. 21), migration and schizophrenia in urban areas. However, Selten has, with his colleagues, also extended social defeat to other phenomena: discrimination (Veling et al., 2007), childhood bullying (van Dam et al., 2012), sexual minority status (Gevonden et al., 2014b) and hearing impairment (Gevonden et al., 2014a). This expansion of the scope of social defeat as an explanation of human experience is repeatedly justified with reference to the original paper (Selten & Cantor-Graae, 2005). This use as a base reference is echoed in the wider literature. Selten's work is highly cited, but these citations often acknowledge the social defeat hypothesis briefly, without critical engagement (e.g. Lederbogen et al., 2011; McGrath et al., 2008; van Os et al., 2010). The intricacies of rat experiments are largely absent in such accounts. Social defeat has thus subtly proliferated in publications, while also remaining unnoticed.

Drawing on a long tradition of experiments with fighting rats, Selten and his colleagues have devised a single proxy for various social behaviours, environments, and relations, a proxy that can be tested and physiologically measured, and used to explain how particular mental disorders develop. This approach moves between 'models of' and 'models for' (Geertz, 1973). The former manipulates symbolic systems to imitate existing non-symbolic systems (e.g. manipulating rats to mimic humans), while the latter manipulates existing non-symbolic systems based on symbolic systems (e.g. understanding humans based on observations of rats). In the following we will expand on the implications this transition has for research.

Selten's biosocial account of human psychoses through the prism of fighting animals led us to wonder how else animal sociality might be used to provide insights regarding human sociality and its relationship with the mind. Selten's use of fighting animals to create this account of the human psyche as constituted within sociality has a peculiar predecessor in Mead. Like Selten, Mead draws on fighting animals as a basis for hypothesizing the biosocial genesis of human mental states, but Mead proposes a more organizational sociality. While we are aware that these are highly different examples, what we attempt through this comparison is less a corrective to Selten – Mead is not the protagonist of this article, nor is Selten the antagonist – and more an experiment in extending a wider epistemological space for imagining human sociality vis-a-vis animal behaviour and the mind. This comparison is salient for biosocial research and sociology because it offers new opportunities to contribute to and learn from alternative responses to social problems.

Dogs and symbolic interaction

For Mead (1934), symbolic interaction (SI) begins with organisms living in groups, inevitably entailing interaction. Interaction, here, is a dance of gestures – one actor performs a gesture and another perceives it. Mead (1934, p. 14) provides the example of fighting

dogs. The arrangements of the dogs' facial muscles reveal the aggressive intentions of each toward its rival. In response to its rival's gesture, each dog rearranges its facial muscles, creating a new gesture. Mead ascribes no intentionality to an animal's expression of a meaning to another animal. The facial muscles of a dog preparing to attack adopt a certain formation instinctively, without the dog intending to transmit a signal. The gesture transmits a signal because it elicits a comparable physiological response in the other dog. Over time, a conversation of gestures can emerge, each dog responding to the other. 'The act of each dog becomes the stimulus to the other dog for his response. There is then a relationship between these two. . . . We have here a conversation of gestures' (Mead, 1934, pp. 42–43).

From this account, Mead delineates an analogous process through which the conscious human mind develops. He distinguishes between the conscious (significant) gestures of humans and the unconscious (non-significant) gestures of non-human animals (1934, p. 81). This distinction is culturally embedded in wider symbolic systems, whereby a conscious gesture is informed by and manifests rich multi-layered meanings beyond the act itself. Symbolism works because multiple individuals attribute a symbol to some specific thing that differs from the symbol (Mead, 1934). This conversation of significant gestures is symbolic interaction. Mead believed that only humans use significant symbols, because they are singularly endowed with sufficient neurological and vocal physiology. Vocal communication is critical because the originator's experience of it is closely akin to the recipient's experience. While one rarely views one's own facial expressions when interacting, one does usually hear one's own words. Vocal communication hence aligns the perspectives of speaker and listener (Mead, 1934, p. 65).

Once able to envisage the situation of the other, one is then able to appreciate the probable response of the other. The internalization of the disposition of the other is organized into an idea of the generalized other – a broad representation of all others within a community. Mead argues that the external conversation of significant gestures is internalized, producing an internal conversation with the generalized other: 'mind'. The mind's conversation is 'the general mechanism of what we term "thought"' (Mead, 1934, p. 73). The presence of thought distinguishes symbolic and non-symbolic interaction. Critically, the mind does not arise neurologically through intrinsic developmental processes before reaching a stage at which it gives rise to social beings. Instead, physiological preconditions facilitate social processes that eventually constitute the mind and its social components.

From fighting dogs, Mead extrapolates a biosocial process through which complex phenomena such as consciousness and society emerge. Despite ending with such ethereal concepts, the entire narrative rests upon socio-physiological interactions between fighting animals. Mead suggests that organisms with basic physiological characteristics, given sufficient proximity, will eventually give rise to complex biosocial processes of mind, and ultimately human mental experience.

Thin sociology

The use of animal models in various sciences is commonplace, as is criticism hereof, especially within psychiatric research. It is not our intention to regurgitate these

discussions (e.g. Nelson, 2018; Rose & Abi-Rached, 2013). Likewise, while both Selten and Mead could be critiqued for their failure to engage with more-than-human sociality and animals as companion species (Haraway, 2008; Kirksey & Helmreich, 2010), such critique is beyond our scope. We are interested in the ways knowledge claims are proposed, assessed and substantiated in Mead and Selten's works – specifically how they employ animal hostility to explicate human sociality in relation to mental states. To preface our point, Mead and Selten both derive particular understandings from animals which, either in the laboratory or the thought-experiment, *fight*. The fighting animal is the starting point of their ideas, and elucidating these understandings is useful in analysing how they conceptualize sociality and, crucially, what potential forms of sociality academics might imagine within biosocial accounts. In this section, we will consider how Mead and Selten differ in the ways they use animals to understand humans, the former casting sociality as organizational, the latter as pathological.

The prescriptions of sociality that we draw out here are implicit in the authors' different analytical aims – social processes for Mead and environment–psychoses associations for Selten. Despite this implicitness, their specific imaginings of sociality are foundational to both accounts. They are also both expansive. Mead sought to explain human society: an evidently grand sociological project. Selten differs somewhat. He began with the specific link between migration and schizophrenia, before broadening his scope to bring different groups under the social defeat umbrella. Today, the hypothesis encompasses varied social inequalities, applying a consistent imagining of sociality based on the experience of being defeated.

Central to Mead and Selten's particular forms of knowledge about human life is the intriguing starting point that they share: the *fighting* animal. For Selten, the notion of the fight is entangled with a view of the urban environment as a 'highly competitive atmosphere' (Cantor-Graae & Selten, 2005, p. 21). The unequal fight between a binary of large rat and small rat comes to echo the unequal relations of certain (reductive) binaries of people – black or white, able-bodied and disabled. Selten's work focuses almost entirely on the symbol of the *defeated* rat, because it is from this rat that he draws comparisons with types of humans. We learn little of the victor.

What is noteworthy here is that these fights are rigged absolutely. In optimal experiments, intruder rats weigh less than residents, and are from less aggressive strains (Koolhaas et al., 2013). This approach entails rather grim imaginings of sociality. In the urban setting, there *is* conflict and a minority group-member *is* defeated. The truth of conflict and defeat is envisaged before the experiment begins, and the experiment is set up to re-enact and capture the pathological realities of this miserable sociality. Of course, most people accept that human interactions are often similarly rigged in unequal societies, with advantaged groups profiting at the expense of the disadvantaged. However, Selten's invocation of this rigged-ness is direct and absolute to an extent that seems difficult to reconcile with understandings of social inequality and structural violence.

Selten's use of fighting rats to represent city-dwelling humans implies that those humans – especially 'dark-skinned migrants', those with hearing impairments and members of sexual minorities – somehow resemble the socially defeated intruder rat. In doing so, Selten populates certain situations, conceptualized in terms of social defeat, with certain stereotypes, particularly those relating to black migrants. Of course, Selten's

comparison only extends so far – he does not suggest that members of human groups are subject to ‘clinch attacks’, and he often switches defeat for ‘social exclusion’ or ‘outsider-position’ (Selten et al., 2013, p. 1180). Despite the use of these phrases, outlines of social defeat provided in the literature typically seem more applicable to animal fights than the experiences of, for instance, a bullied child.

This problem is attributable to Selten’s work resting upon the assumption that because the downstream molecular effects of fighting in rats and exclusion in humans are comparable, the initiating social phenomena must also be somehow aligned. This represents a specific assumptive problem because biologic parity does not necessitate social parity. A problem emerges as the initiating social component of the biosocial account (e.g. clinch attacks) comprises behaviours that are (mostly) alien to human experience. Translating the peculiarities of rat aggression into a sociological theory is a major conceptual challenge. The social connotations of biologic similarities are forced into an unconvincing alignment to correspond with molecular observations. There is hence a risk, familiar to medical sociologists, that human behaviour is reduced to biology (Meloni et al., 2016). There are parallels here with sociobiology and criticisms thereof (see Alcock, 2001).

The problem leads to subsequent attempts to flesh out social defeat’s biology-centred sociality. In practice, Selten and colleagues (2013) have used Gilbert and Allen’s (1998) ‘defeat scale’ to measure defeat. The scale uses self-report indicators such as: ‘I feel that I have not made it in life’ and ‘I feel that I am one of life’s losers’. This particular operationalization further muddles the picture, forwarding multiple ideas of the forms of sociality which ostensibly cause mental disorders. We have the notions of defeat, outsider position, exclusion, and feeling like a loser. These ideas are used interchangeably and lack grounding in a coherent conceptualization of sociality. They are a form of what we call ‘thin sociology’. We use this term to invoke the opposite of ‘thick description’. Briefly, ‘thick description’ indicates a wide and nuanced description of social situations, one that considers the varied interpretations and activities of the actor. As the classic example goes, a thin account cannot distinguish between a blink and a wink, seeing both as contractions of the eye lid (Geertz, 1973). Thin description is not wrong – just *thin*. The *thinness* of social defeat is problematic, as it casts the urban environment *purely* as an amalgamation of negative buzzwords relating to the racial discrimination that is assumed to constrain their mental health. This thin sociology creates several sociological problems.

Pathological or organizational sociality

A social defeat notion of sociality neglects inequality, often posited as central to understanding health disparities (e.g. Allen et al., 2014; Wicks et al., 2005), instead preferring the imagery of a one-on-one fight, a winner and a loser. Sociological literatures have for decades offered a variety of concepts (e.g. ‘habitus’, Bourdieu, 1977) to help us understand how inequality and poverty do not simply arise from interactions, but are intractably present within and perpetuated through these interactions. This neglect is interesting, because the intruder-experiment relies on in-built inequalities, as the rats are paired to mismatch each other in terms of weight and aggression. It is also notable that the

experiment is conducted with fighting males and companion females, but that the implications of this gendering are never discussed.

The hypothesis of social defeat seemingly offers a way of thinking about inequalities, but Selten and his colleagues instead prioritize a sociological reading of these experiments centring on fighting and losing. This curious sociological reading of resident–intruder experiments, and subsequent application to humans, denotes a specific imagining of sociality as combative and pathological. This emphasis can be traced to mid-20th century ecological research regarding violence in densely populated rat colonies. Several disciplines (e.g. sociology and psychiatry) have drawn on these studies to cast human cities as analogously dystopic and violent (Ramsden, 2009). Social defeat’s presentation of pathological sociality must also be interpreted within a research economy that typically prefers work on pathogenic phenomena, e.g. stress, over salutogenic considerations, e.g. resilience. The peculiarities of these claims implicate specific underlying conceptualizations of sociality. We are not suggesting that such research is naïve to relevant social concerns, but rather that it is pragmatic reductionism, whereby broader factors such as health inequalities are condensed to facilitate complex research that would otherwise be impractical (Niewöhner & Lock, 2018).

In contrast, Mead’s approach has the opposite problem. It attributes undue romanticism to lives lived within urban environments. Mead sees conflict as temporary, and the endpoint of symbolic interaction as ‘a universal society that includes the whole human race’ (Mead, 1934, p. 282). For Mead, individuals enjoy a reasonable equality of social opportunity because of their broadly universal physiological characteristics, especially regarding neurological and vocal hardware. Human equality is hence biological, and subsequent inequality incidental.

Mead’s appeals to ‘universal society’ and ‘the whole human race’ provide a counterpoint to Selten’s ascription of defeat to minority groups. However, such appeals lack appreciation of any kind of structural inequalities, theories of power, discourse, and most other major sociological concepts outside of the interactionist tradition. Importantly, they lack an appreciation of discrimination and racism. Mead sees few meaningful social differentiations in society, believing that those which do exist will eventually dissipate. The result is an imagining of society that struggles to grasp conflict and inequality, and so renders such considerations invisible. Conflict is barely noted in any form, be it situational or institutional. Mead therefore offers another type of thin sociology, devoid of richer sociological concepts that characterize the discipline.² This renders it an especially useful comparator for Selten’s social defeat, as both share a narrowness that is not as present in many other sociologies. Social defeat has more in common with Mead’s symbolic interaction than it does with many other sociologies.

However, Mead’s epistemic approach to sociality is a useful means of reflecting on social defeat. Mead opens up a wider space for understanding agency, something which is found wanting in social defeat. The symbolic interactor always has the potential to be defeated, to be victorious, or to be something else entirely – a potential that is not shared by the epidemiological subjects of social defeat.

Let us illustrate this point with an example from a recent social defeat study, co-authored by Selten (Gevonden et al., 2016). The researchers explored reactivity to ‘social stress’, hypothesizing that repeated exposure to stressors, such as discrimination, leads to

greater reactivity to 'social stress'. Comparing 'Moroccan-Dutch' to 'Dutch men', experiences of social defeat were measured via a questionnaire, but no differences between the groups were found, undermining the hypothesis. In response, the authors contend that it 'is unlikely that the Moroccan-Dutch participants did not feel to some extent excluded, because their position in Dutch society is extremely vulnerable' (Gevonden et al., 2016, p. 634). Here, the notion of social defeat precludes an openness to what it means to be Moroccan-Dutch in the Netherlands and how those men's experiences might shape their forms of life. Thinking social defeat 'diffractively' (Barad, 2014) through Mead thus highlights specific imaginings of agency within social constraints. In social defeat, the rats are impelled to fight, and the result of that fight is essentially predetermined. Mead's dogs need not necessarily fight, and the outcome of any conflict is not certain, being dependent on the idiosyncrasies of a complex and unique interaction. While Selten's sociality is *always* combative and pathological, Mead's has the potential to be so, alongside various other potentials.

The overarching problem with both Selten and Mead is a shared simplification and excessiveness, whereby blanket concepts of organization or defeat are applied universally. There are parallels here with Scott's (1998) 'thin simplification', whereby efforts to impose simplistic logics on real-life diversities beget deleterious consequences. Multiple aspects of human sociality are overlooked. While reliable rat behaviours and outcomes correspond with fixed epidemiological imaginings of human behaviours and outcomes, they are less applicable to the experiences of individual people. The theorizing done around social defeat only works for the epidemiological subject, and not for living, breathing humans. Social defeat is a static category that does not allow for the processual, evolving, *human* elements of sociality – as symbolic interaction does – instead presenting us only with a fixed notion of a defeat. Mead's symbolic interaction goes too far in its neglect of social structure and associated conflict, at worst ignoring inequality. However, its focus on the processual character of human interaction might provide a more informative notion of the forms of sociality that are implicated in the onset of mental disorders. We do not wish to abolish or supplant Selten's approach. It is a laudable attempt to substitute a correlational black-box with a causative mechanism. Its explicit attempts to work in the interstices between sociality and biology, and to bridge them, are filled with potentials. We highlight pertinent aspects of Mead's work and its implications for social defeat as a means of contributing to this effort.

Mead's idealism provides a valuable counterbalance to the unequivocal negativity of social defeat. It stimulates questions regarding the conceptual parameters of social defeat and whether sociology might be able to contribute to a deepening of its focus. What might we learn from subjecting the victorious rat to the empirical and intellectual scrutiny that has so far been reserved for the loser? What might we learn from modelling interactions that are less outrightly predetermined and evolve more naturalistically? Another traditional sociological lesson that might be taken from Mead and applied to social defeat is the sustained importance of relationships, potentially informing more 'ecologically valid' and therefore naturalistic experiments. Embracing sustained relationality could contribute to Niewöhner's (2011) concept of 'customary biology', situating molecular processes exist within habitualized lives, of which relationships are a central feature. For Selten, the social interaction of the fight begets a biologic process

that is subsequently limited to and measured within an individual. In contrast, Mead's biosocial process is continually socially constituted. Recognizing this protracted relationality, social defeat might benefit from the repeated monitoring of rats as they interact over a substantial timeframe (see Koolhaas et al., 1995 on temporality in rat-based stress research). Such observation could dissolve binary approaches to pathological and organizational sociality, potentially revealing more complex biosocial processes.

Embracing differences and similarities

Another interesting comparison between Selten and Mead is that they differ entirely in their ideas of animal–human comparability. Mead strictly distinguishes humans from other animals by virtue of their neurological and vocal physiology, and by extension their exclusive access to symbolism. This symbolism distinguishes the 'biologic individual' from the 'socially self-conscious individual' (Mead, 1934, p. 347). Mead's appeal to the uniqueness of humans can appear unduly zealous considering contemporary understandings of symbolic communication in other species (Irvine, 2003). It is also this assertion of humans' unique consciousness that partly alienated Mead from behaviourist thought (Cook, 1977). Those who extend rat models of social defeat to conceptualize human experience often appear to work in the opposite direction, moving from rats to people in a manner that minimizes differences (Manning, 2019). Selten thus uses observations of the sensitization of the mesolimbic dopamine system to establish biosocial parity between rat and human. As with their aforementioned ideas of the qualities of interactions, both scholars inhabit opposite extremes regarding the sameness/differentness of animals and humans.

In contrast with Selten's view of sociality as conflictual, Mead views interaction as an organizing process through which conflict is diminished. Over time, meanings are shared among actors and their shared social action becomes more cohesive. Symbolic interaction is hence a sort of social force impelling groups away from conflict and toward cooperative coexistence. To this end, he emulates Plato and Aristoteles' veneration of the city-state as the ideal form of social organization (Mead, 1934, p. 266), encouraging rationality, self-governance and good neighbourliness. This is an interesting divergence. While Selten identifies the city as an especially hostile environment, Mead singles it out as especially cohesive. These opposed characterizations of urban life are both grounded in animal comparisons, with Selten emphasizing similarities and Mead differences. Animal-based analogies for Mead's imagined city could easily be found (e.g. beehives) so it is notable that he focuses on differences, particularly given the similarity-focus in much contemporary biosocial animal modelling.

Mead presents the warring biologic individual and the cooperative socially self-conscious individual as opposite ends of the interactionist process, transitioning from conflict to cooperation. Fighting animals are employed to evidence the precursor and antithesis of human coexistence. While Selten draws on work equating the violently competitive rat colony with the human city (Ramsden, 2012), Mead presents a semi-Darwinist/semi-functionalist world-view in which large-scale human societies represent the utmost cohesion, in contrast to fighting animals. Despite similar beginnings (fighting animals), mediums (biosociality) and ends (human mental states), the two scholars

diverge in how they enact their comparisons. Selten turns to fighting rats to show us what we are; Mead gives us fighting dogs to show us what we are not. It is important to appreciate this divergence of thought because it reveals that appeals to animal conflict as some sort of touchstone for understanding humans can be developed in opposite directions.

That the two scholars use fighting animals in such different ways poses important questions regarding the utility of drawing similarities and differences in comparative theorizing. Selten seems to be invested in emphasizing animal–human similarities to establish an empirical basis for social defeat. This approach appears somewhat intuitive – a model should resemble that which it models. However, Mead’s use of fighting dogs reveals that the extrapolation of similarity is not necessary to an account of humans based on animal behaviour. He develops a theory of mind in reference to animal–human dissimilarities. This approach to fighting animals has important implications for social defeat. What would happen if rat models of stress were used to explore *dissimilarities* with human sociality and mental health? Might the dissimilarities between the physical violence of fighting rats compared with the symbolic violence of competing humans, or the one-on-one hostility in the resident–intruder experiments compared with the group-level tensions in human societies, teach us something about biosocial mechanisms of mental illness? These questions emulate longstanding anthropological concerns regarding similarities and differences, universalism and relativism (Brown, 1991). As such, similarities and differences are another area in which sociology may be able to make significant conceptual contributions to biosocial research.

The emphasizing of similarities between animal and human sociality is a problem in social defeat because it is a by-product rather than a key component. This is evident in the strange way in which Selten looks to fighting rats to operationalize human social processes that he portrays as being commonplace in society. Such portrayals imply that investigating the social defeat of certain populations should be relatively easy – one could simply observe people interacting within any multi-ethnic urban location. However, this is not the case. If one were to observe a native and a migrant sitting side-by-side on a bus, it is unlikely that they would interact at all, let alone resort to clinch attacks (this is before one enters into questions of what ‘native’ and ‘migrant’ means). Of course, such seemingly innocuous interactions may manifest powerful instances of structural violence (see Charlesworth et al., 2004), but likewise, they may not. This tension reveals that Selten’s use of rats to represent human social phenomena is a by-product of the use of rats to represent associated human biological phenomena, because that biology is much more difficult to study in humans. As such, the uniting of separate traditions within biosocial research unwittingly imposes the practical difficulties of molecular research in human subjects onto social research that need not be subject to the same constraints. Selten’s efforts to establish a biological parity between rat and human leads him to establish a corresponding social parity that is suspect. This may be emblematic of a problematic feature of animal-inspired biosocial accounts of mental illness. That either the biological or the social phenomena correspond in some way does not necessarily entail that the other phenomena are similarly related.

There is, of course, an underlying question of whether the thinness of sociological conceptualizations within some biosocial research really matters, and if so to whom. It seems obvious that sociologists would dislike such thinness and perceive it to be a crucial flaw,

while psychiatrists would see the issue as incidental. However, it is crucial to note that we do not just think this theory should be wholly discarded. Rather, we would argue that the scholarship on social defeat can be a productive centre for imagining human biosociality in different ways. This is, paradoxically, because of social defeat's relative 'thinness' in terms of its sociological imagining of the world. In response to this consideration, we return to those appeals to 'revitalize' the relations between sociology and psychiatry noted in the introduction to this article (Fitzgerald et al., 2016). To this end, Callard and Fitzgerald (2015, p. 48) note that 'the developmental, and indeed ontological, inseparability of biological and social life underwrites many of the most compelling ways in which social scientists . . . and neuroscientists have learnt to labour together'. As the biosocial offers new potential for incorporating the social into traditionally biology-focused work, the concepts of the social that social scientists encounter in these projects are likely to be somewhat underwhelming. Rather than despairing, sociologists should seize the opportunity to contribute to richer understandings of the biosocial entanglements of human life. It is in this spirit that the Mead–Selten comparison is an example of 'livelier ways of working and thinking' the social in the biosocial (Callard & Fitzgerald, 2015, p. 56).

Finally, while our primary aim is to provide a specific example of how sociology can contribute to the development and improvement of biosocial research, we are also keen to emphasize that sociology can itself be much improved through such engagement. Resident–intruder experiments have revealed substantial molecular similarities between rats and humans in terms of stress responses to certain interactions. Mead's symbolic interaction emphasizes the physiological uniqueness (and seeming superiority) of humans, to an extent that seems questionable in light of biosocial research. This perhaps exemplifies Timmermans and Haas's (2008) critique of a sociology with insufficient biology. From this position, Mead progresses to propose a corresponding social uniqueness, and in doing so undermines the prospects for an animal-embracing biosocial sociology. Given its organic behaviourist flavours, Meadian interactionism could potentially generate more sophisticated physiological hypotheses through engagement with animal similarities.

Conclusion

In this article, we have sought to critically reflect on the application of social defeat to human psychoses. We have argued that, because of an attempt to reconcile animal and human sociality, Selten promotes a problematic imagining of human sociality as hostile and pathological. To explore this problem, we have used Mead's account of symbolic interaction in *Mind, Self and Society* as a means of comparative analysis. Beginning with intriguing similarities – the extrapolation of observations of fighting animals to theorize the biosocial genesis of human mental states – we have used Mead to critically analyse social defeat and to suggest potential remedies and future directions for improving understandings. We have pursued our concern that by moving from fighting rats to interacting people, Selten over-emphasizes similarities and as a result offers a limited and pessimistic portrayal of human sociality. Within this imagining of society, minority groups are especially denigrated and hence pathologized, in a manner that seems incompatible with the diverse experiences and identities of real people.

Mead provides a counterpoint to this emphasizing of similarities because, while similarly using observations of fighting animals to ground a theory of human conduct, he does so through an exploration of the dissimilarities between fighting animals and human sociality. This sociological account is 'thin' in a manner resembling social defeat, albeit in the opposite direction, being devoid of structural concerns and largely ignoring the potential for conflict in human societies. Though flawed, Mead's approach reveals potential routes around problems with contemporary applications of social defeat to human psychoses through engaging with dissimilarities and variable processes, rather than downplaying them. As contemporary mental health research rejects biological determinism and moves toward relations between sociology and psychiatry reminiscent of the early 20th century, it is only natural that we should seek to learn from that period of scholarship. In this respect, despite its noted flaws, interactionism has much to offer, and to learn from, contemporary social defeat research.

At a broader level, the comparison raises interesting questions for sociologists looking toward the biosocial. The exploration of human social experiences through the lens of *fighting* animals specifically is an intriguing epistemic practice. Is something about conflict specifically indicative of human life? Is something about conflictual relationships more generalizable than is the case for harmonious relationships? Could it be that conflict is more immediately tangible and therefore conducive to empirical interrogation? Or is it that the abrasiveness of conflict imposes it more prominently on the minds of scholars than more mundane forms of interaction? In posing these questions, the analysis of social defeat through Mead reignites traditional sociological tensions between conflict and functionalist approaches to society. The ultimate challenge presented here is to explore human experience in ways that avoid totalizing characterizations of those experiences. It is perhaps in this manner that Selten and Mead can be best brought into fruitful dialogue.

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Notes

1. Size is used to ensure differentiated responses from two individuals. Similarly, Mead (1934, p. 49) noted: 'Where the big dog attacks the little dog, the little dog puts his tail between his legs and runs away.'
2. Another contributing factor to this thinness is Mead's predilection for an organic behaviourism, albeit redefined as a 'social behaviourism' due to the inclusion of matters of hypothesized psychology, mind and self that were at odds with traditional behaviourist tenets (Cook, 1977).

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