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The behavioural constellation of deprivation and its extended causes and consequences*

*This is an unedited, uncorrected preprint of a response article accepted to Behavioral and Brain Sciences on 25th June 2017. It was written in response to commentaries on the original target article, “The Behavioural Constellation of Deprivation: Causes and Consequences”.

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Abstract:

We are grateful to have received so many insightful commentaries from interested colleagues regarding our proposed behavioural constellation of deprivation (BCD) and our thoughts on its causes and consequences. In this response article, we make some clarifications regarding our perspective and tackle some common misperceptions: including, for example, assumptions that the BCD is adaptive, and that it should include all behaviours that vary with socioeconomic status. We then welcome some excellent proposals for extensions and modifications of our ideas, such as the conceptualisation of the BCD as a risk management strategy, and the calls for a greater focus on strengths and differential investment, rather than deficits and disinvestment. Finally, we highlight some insightful explorations of the implications of our ideas for ethics, policy and practice.

We are extremely grateful to have had the rare opportunity to receive, and respond to, feedback from so many of our esteemed colleagues on the ideas presented in our target article. They have done an excellent job of critiquing, extending, and exploring the implications of the perspective we presented for enhancing the understanding of socioeconomic variation in behaviour and health outcomes.

In the target article, we made the case that there is a cluster of behaviours associated with lower socioeconomic status (SES), which we call the behavioural constellation of deprivation (BCD). We proposed that this BCD results partly from the relatively limited personal control experienced by people of lower SES. We suggested that limited personal control curtails the extent to which people can expect to realise deferred rewards, leading to more present-oriented behaviour in a range of domains. In the target article we emphasised that we see these present-oriented behaviours as a contextually appropriate response to structural

and ecological factors, rather than pathology or a failure of willpower—a perspective which some of our commentators have engaged with in their responses. The target article also used principles from evolutionary theoretical models, such as feedback loops, to explore ways in which socioeconomic inequalities might become amplified and embedded—concepts which some of our commentators have expanded upon. We also summarised some of the potential mechanisms underlying the BCD, and our commentators have helpfully added to the list of mechanisms, generating a more in-depth picture of the interactions between potential mechanisms and of how they might alter with the different trade-offs experienced throughout the life course. Our target article also briefly touched on the implications of the perspective we presented for ethics, policy and practice. We thank the commentators who used their expertise in applied behavioural science to further elaborate upon the practical and societal implications of the ideas we put forward.

Our response to the commentaries is organised into themes. The sections within **R1** clarify what we set out to do in writing the target article. For example, we discuss what behaviours the BCD was meant to include, and what was intentionally omitted (**R1.1**). In **R2** we make some clarifications regarding misconceptions about our arguments that were evident in the commentaries—such as the perception that our ultimate explanation is mutually exclusive of explanations at the proximate level (**R2.1**). In **R3** we tackle criticisms from **Sherlock & Zietsch**, who object to a founding assumption of our work: that principles originally used to understand the evolution of traits over generations can enhance our understanding of how behaviour is shaped by environment within an individual's lifetime. In **R4** we emphasise and discuss some of the excellent suggestions that our commentators put forward for deepening and extending our framework. These include the ideas; that the BCD can be viewed as a risk management strategy, offering a more parsimonious explanation for a broader constellation of behaviours (**R4.1**); that there is a physiological constellation of

deprivation that entails similar trade-offs to the behavioural one (R4.2); and that the contextually appropriate response perspective should include a greater focus on strengths and differential investment, in addition to considering deficits and disinvestment (R4.3). In R5 we highlight commentaries which presented valuable analyses of the implications of our perspective for ethics, policy and practice.

R1 We told a simple story, for didactic purposes

Our target article told a simple and, in some respects, simplified story. In part this is because it is impossible in any one paper to discuss all of the points which may be deemed relevant, or to cite all of the available evidence. Additionally, we wanted to ensure that our key messages were not lost in a cloud of caveats, alternatives and details. Faced with a trade-off between illustrating core principles in a memorable and digestible manner, and including the nuance that some readers might crave, we tended more towards discussing core concepts than specific details. Inevitably, this means that some of the critiques of our target article have come from colleagues who would have liked to see us discuss or explain more types of socioeconomically patterned behaviour, more of the potential predictors of those behaviours, or more of the possible underlying mechanisms. In this section, we emphasise that the perspective we presented in the target article was not intended as a “theory of everything”, to be applied in all contexts to all behaviours (R1.1). We also recognize that the target article was by no means intended to identify all of the potential mechanisms underlying the BCD (R1.2), or all of its potential driving forces (R1.3).

R1.1 The BCD should not incorporate all behaviours associated with SES, and SES-behaviour associations may vary with context

In our target article, we presented a range of behaviours that appear to be somewhat consistently socioeconomically patterned, with their defining common feature being that they

can all be conceived of as a response to being faced with trade-offs between present and future outcomes (our BCD). The BCD was not intended to incorporate *all* behaviours that vary with SES. Neither was the contextually appropriate response perspective, presented in relation to the BCD behaviours, intended to explain *all* socioeconomic differences in behaviour. We simply offered a possible means of understanding this particular cluster of behaviours (the BCD behaviours listed in section 2 of the target article) as a contextually appropriate response to a common explanatory factor--the strength of the present-future trade-offs that people face.

We also did not mean to suggest that *all* variation in BCD behaviours can be explained by these present-future trade-offs. It is unlikely that any phenomenon, particularly one as complex as patterns of human behaviour, can be pinned to a single explanatory factor. We simply propose that a meaningful proportion of the variation in BCD behaviours should be attributable, via appropriate psychological pathways, to individuals' experiences of future-limiting factors. (This does not mean that we don't acknowledge that some other meaningful portion of variation in BCD behaviours might be explained by other factors, such as the experiences of relative disadvantage discussed by **Novakowski & Mishra**).

In response to our target article, **Breugelmans et al.** argued that the “...*behavioral constellation of deprivation (1) overestimates the coherence of the various behaviors associated with poverty and (2) underrepresents the range of behaviors that should be included in such a constellation.*” This would certainly be true, had we intended to argue that *all* socioeconomically patterned behaviours should be included in the BCD. Perhaps the response of **Breugelmans et al.** indicates that our chosen title, “the behavioural constellation of deprivation”, is a little aggrandised. Nonetheless, we felt that the label would be more memorable and relatable than a more-accurate but less-wieldy title such as, “a cluster of often-socioeconomically-patterned behaviours united by their connection to temporal trade-offs”.

Several commentaries raised the issue of socioeconomic variation in social and cooperative behaviour, either assuming it to be part of the BCD, or arguing for its inclusion. For example, **Grossmann & Varnum** point out that lower SES is associated with greater accuracy in identifying others' emotions, and greater compassion towards others—perhaps because in-group coordination can help to buffer against scarcity and external threats. **Robinson & Piff** argue that increased prosocial behaviour amongst lower-SES individuals may serve to provide increased control in the context of more-threatening social environments. **Srivastava & Srinivasan** highlight the trend towards more charitable and prosocial behaviour in lower-SES individuals, suggesting that our target article ought to have put more emphasis on the existence of such positive behaviours amongst those of lower SES. In response to these commentaries, we wish to emphasise that we are open to the extension of the BCD to incorporate social and cooperative behaviours that vary with SES. Such extension would however require demonstrating that these behaviours share the same underlying logic as the BCD behaviours we have outlined. If they do not, they may well be socially patterned but not usefully viewed as part of the BCD as we define it (see also section **R4.1**).

Pearson & van der Linden discuss the specific example of pro-environmental concern—something which they say is more common amongst those of lower than higher SES (although see Gifford & Nilsson, 2014, who summarise evidence suggesting greater environmental concern in middle and higher social classes). They rightly point out that environmental behaviours entail an intertemporal trade-off. However, these behaviours also involve other dimensions such as common goods problems, and the harms and the costs of mitigation fall differentially on different social groups. As such, the proportion of variation in environmental behaviour that could be explained by exposure to future-limiting factors may be somewhat limited. Thus, as highlighted by these commentaries, if we wished to expand the BCD to incorporate a broader range of socioeconomically patterned behaviours, other

explanatory factors such as social context would need to be taken into account in our explanation of it. We prefer in this instance to put forward a simple causal account of a narrow range of behaviours, than a complete but multifactorial treatment of all SES-patterned behaviours.

Just as we did not mean to imply that the BCD should include *all* socioeconomically patterned behaviours, we did not intend to suggest that the elements of the BCD should be apparent among *all* lower-SES individuals, or in *all* contexts. In our target article, we attempted to dispel such ideas with our section entitled, “The BCD only applies on average” (section 8.1). However, we may not have made our point sufficiently clear: There will be situations in which there are limited or no SES differences in experiences of the intertemporal trade-offs which we argue drive the BCD. That is, if the BCD is driven by trade-offs that tend to be more common at low SES, rather than by SES per se, then the association between SES and those trade-offs is required for there to be any relationship between SES and BCD behaviours.

If the BCD is not driven by SES per se, having hypotheses about specifically what facets of lower- or higher-SES life affect the BCD behaviours we are interested in can lead to more precise measures, allowing us to account for more of the variation in those behaviours. For example, our contextually appropriate response perspective would lead us to predict that exposure to extrinsic (uncontrollable) mortality risk (which tends to be greater at lower SES) should be a better predictor of health behaviour than SES (which is associated with, but does not necessarily directly influence, health behaviour). Indeed, in a survey of North American adults, we found that those of lower subjective SES reported making less effort to look after their health and also perceived a greater portion of their mortality risk to be extrinsic. The relationship between SES and self-reported health behaviour was entirely mediated by respondents’ perceived extrinsic mortality risk. That is, SES was no longer a predictor of health

behaviour once perceived extrinsic mortality risk was controlled for (Pepper & Nettle, 2014). Although this finding requires further replication and elucidation, it suggests that, in some cases, perceived extrinsic mortality risk may provide a more precise predictor or control measure for studies of health behaviour than SES. Our target article, and its commentaries have listed various other future-limiting factors that, like perceived extrinsic mortality risk, have the potential to account for more of the variation in BCD behaviours than SES itself.

There may also be times when some BCD behaviours are more strongly influenced by other factors, making explanations regarding intertemporal trade-offs less applicable. For example, **Ramos & Daly** point out that, whilst research from wealthier countries supports the existence of the BCD as we have defined it, the patterns we have described do not seem to generalise to Latin American populations. They state that research in Argentina and Mexico shows the use of alcohol, drugs and tobacco to be more common amongst those of higher SES—perhaps because poverty in such countries is more extreme, and those at the bottom of the SES ladder lack the financial means to use such substances. Such examples highlight the need to consider context: moderating and limiting factors will apply.

R1.2 We didn't set out to list all the proximate mechanisms that might underlie the BCD

Our commentators have done an admirable job of adding richness to the picture regarding potential proximate mechanisms of the BCD. They have provided discussions of potential proximate psychological mechanisms such as optimism and pessimism (**Mittal & Griskevicius**), envy (**Novakowski & Mishra**) and self-control (**Carmel & Leiser**), as well as physiological mechanisms such as differential immunological investment (**Garcia & Blackwell**) and DNA methylation (**Brown & Olding**). In the target article, we did not attempt

to list all of the possible proximate mechanisms that might underlie the BCD. We hoped that our commentators would add detail in this regard, and are grateful to them for having done so.

Many of our commentators appear to have understood that our attempt to explain the BCD was largely at the ultimate, rather than the proximate level. That is, we aimed to explain the BCD in terms of the payoffs to BCD behaviours in the context of deprivation, rather than explaining it in terms of factors such as self-control, which we view as psychological mechanisms underpinning BCD behaviours. In section 4 of the target article, we emphasised that proximate explanations do not preclude ultimate ones: rather they are complimentary, with ultimate explanations telling us why a behaviour should occur in a given context, and proximate ones telling us how that behaviour is delivered via cognitive or physiological mechanisms (Scott-Phillips, Dickins, & West, 2011). Despite this effort, some commentators have proffered proximate explanations for the BCD as though they were mutually exclusive of our ultimate one. For example, **Doebel, Michaelson & Munakata** suggest that we have made a false dichotomy by contrasting personal control with self-control abilities. However, under the perspective we have put forward, self-control is considered a proximate psychological mechanism underpinning the link between limited personal control (over future-limiting factors) and BCD behaviours. We cover this issue in more detail in **R2.1**, where we discuss whether the “alternative” explanations offered by commentators are truly separate accounts.

R1.3 We didn't intend to pretend that mortality is the beginning and end

In section 2.3 of the target article, we focussed on the specific example of extrinsic mortality risk as a future-limiting factor driving the BCD. We did this in part because uncontrollable mortality risk is an extreme example of a future-limiting factor, but also because it has been extensively examined in pertinent evolutionary models. In section 2.4 of the target article, we went on to acknowledge that many other future-limiting factors will be important,

giving some examples of these. Nonetheless, commentators such as **Uggla** and **Riis-Vestergaard & Haushofer** have objected to our focus on extrinsic mortality risk as an example. **Uggla** highlights studies that show small effects of area-level extrinsic mortality in comparison to individual-level measures of SES. Meanwhile **Riis-Vestergaard & Haushofer** suggest that observed rates of temporal discounting across countries are too high to be accounted for by extrinsic mortality risk alone. Of course, they are most likely right about this. Whilst extrinsic mortality risk offers a convenient illustrative example that is easy to grasp, in reality people living with deprivation face a multitude of subtle and varied future-limiting factors, which are likely to have a cumulative effect. Indeed, **Riis-Vestergaard & Haushofer** offer some additional examples of such factors, including liquidity constraints, income uncertainty, and the unpredictability of the social environment. Other commentaries have expanded upon this list by discussing influences such as capital constraints (**Rickard**), low cultural consonance (**Quinlan**), and the limited control experienced as a result of operating close to budgetary boundaries (**Srivastava & Srinivasan**).

R2 Misperceptions that suggest a need for further clarification

In our target article, we aimed to address potential misinterpretations of our perspective by dedicating a section of the paper to clarifications and caveats (section 8). Nonetheless, it seems that there is always room for further clarification. In this section of our response, we discuss some “alternative” explanations for the BCD that have been put forward by our commentators, and suggest that they are not necessarily mutually exclusive of the explanations we offered in the target article (**R2.1**). We also discuss some of the terms that we used in the target article, and explain why we actively avoided the use of more-obvious alternative terminology. For example, we explain why we avoided mention of “life history theory” in the

target article (**R2.2**) and why we described the BCD as a “contextually appropriate response” rather than as being “adaptive”, “rational”, “logical” or “optimal” (**R2.3**).

R2.1 “Alternative” hypotheses that are not mutually exclusive to ours

A number of our commentators have proffered explanations for the BCD, which they either explicitly state, or imply, are alternative to ours. For example, while **Srivastava & Srinivasan** agree that differences in temporal discounting may underlie a portion of observed socioeconomic differences in behaviour, they suggest that extrinsic mortality risk is not sufficient to explain these differences. They instead posit that, “...*our alternative hypothesis is that the reason low SES subjects demonstrate steeper time discounting is that they have greater experience with planning and control failures caused by always operating close to budgetary boundaries, which in turn arises inevitably from having to consistently operate with limited budgets of money, status, trust or other forms of social utility.*” We agree that extrinsic mortality risk cannot be sufficient to explain all socioeconomic variation in behaviours related to temporal discounting. Indeed, we have emphasised in section **R1.3** that we did not intend to suggest this.

We also agree that people of lower SES are more likely to experience what **Srivastava & Srinivasan** term ‘planning and control failures’, affecting their temporal discounting. Indeed, we discussed this in section 2.2 of our target article, which outlines the ways in which having limited wealth, education, or social connections can curtail personal control and thereby the ability to influence future outcomes. We used limited control over mortality risk as an example in the target article, but also included a section on other factors (2.4). To this section, we could easily add the explanation given by **Srivastava & Srinivasan** that, “*Low SES individuals will naturally find planning and controlling actions at long time-scales inefficient, since plans with low resource reservoirs underpinning them are more susceptible to being*

overturned by small random socio-economic fluctuations...” They have usefully illustrated another future-limiting factor experienced at lower SES—limited reserves increase vulnerability to socio-economic perturbations. As such, this is not an *alternative* hypothesis, but a complementary one.

Some other commentators suggested that *proximate* mechanisms such as self-control are alternative explanations to the *ultimate* one we outlined in the target article. **Doebel, Michaelson & Munakata** suggest that “...*contrasting contextual factors with self-control may be a false dichotomy.*” This was not a dichotomy we intended to make, since we view self-control as a mechanism that calibrates behavioural responses to contextual factors. In the same vein, **Carmel & Leiser** “...*substitute a different psychological explanation, and argue that self-control explains those behaviors, instead of ‘extrinsic mortality risk’.*” They argue that “short-sighted” decisions can be “...*explained by the limited attention span brought about by financial scarcity.*” However, in our target article (section 4), and in section **R1.2** of this response, we have emphasised that we view individual psychological mechanisms such as self-control as proximate pathways delivering the BCD in response to its ultimate cause—lack of control over future outcomes. As such, we do not view explanations invoking concepts such as self-control as being alternative to our explanation. These explanations work together at different levels, ours being ultimate, theirs being proximate.

As we have already stated in the target article, viewing these proximate and ultimate explanations as part of the same picture alters our perspective regarding concepts such as self-control: rather than being a mysterious internal resource that sometimes fails us due to cognitive constraints such as limited attention span, self-control can be viewed as a psychological mechanism guiding our behavioural response to the trade-offs we face. This is the essence of the contextually appropriate response perspective. It is important because it

suggests that, rather than pejoratively viewing present-oriented decisions as resulting from a failure to muster sufficient cognitive resources to be future-oriented, we might view them as appropriate decisions for that person given their context.

In addition to offering putatively alternative explanations that conflate levels of explanation, some commentators mistakenly suggest that evidence in support of phenomena not explained in our target article can be taken as evidence against the perspective we outlined. For example, **Rad & Ginges** present their finding that Muslim participants who were fasting for Ramadan became more risk and loss averse than those who were not. They propose that, because fasting entails the experience of self-induced scarcity (it is within individual control), then it should not alter decision-making if our explanation about low control eliciting BCD behaviours were correct. Their finding is interesting for a number of reasons, however it does not undermine our explanation for the BCD: Evidence that people become more risk averse under self-induced scarcity is not tantamount to evidence that people do not become more risk averse under involuntary scarcity. Moreover, there are many cases where humans activate through voluntarily action mechanisms that evolved to respond to involuntary experiences. Self-imposed dieting makes people hungry, and self-imposed viewing of horror movies makes them scared. This hardly refutes the idea that fear is an evolved mechanism for responding to threats experienced involuntarily.

R2.2 We intentionally avoided referring to life history theory

We actively avoided characterising our explanation for the BCD as ‘life-history theory’ in our target article, although the term might have been relevant. Despite this, many of our commentators’ responses suggest that they have assumed our contextually appropriate response explanation for the BCD to be life-history theory repackaged (**Brown & Olding; Grossmann & Varnum; Jones; Mittal & Griskevicius; Quinlan; Ugglá**). We therefore take

this opportunity to clarify why the BCD should not be conceptualised as a life-history strategy, and why we do not wish to claim that it can be explained by life-history theory.

Our chief motivation was that in the human sciences, ‘life-history theory’ has come to have several distinct referents. Life-history theory was originally developed to explain species-typical patterns of growth and reproduction in terms of fitness maximisation in a given ecological context (Promislow & Harvey, 1990; Stearns, 1977, 1992). In this sense, life-history theory is really a set of methods (formal approaches for explicitly modelling how selection would be expected to act on patterns of growth and reproduction), rather than any particular set of empirical claims. Indeed, one of the main lessons of this kind of modelling is that selection can favour many different things, depending on detailed assumptions about the ecology, the biology of the organism, demography, and other such factors. Thus, specific life-history models make specific predictions, but it is hard to make statements about the predictions of life-history theory, in sense described above, in general (Baldini, 2015). For this reason, although we discussed some relevant life-history models, we would not describe the existence of the BCD as ‘predicted by life-history theory’ without further specification.

A second sense of ‘life-history theory’ that one finds is the idea that a broad group of human behaviours covary along a single axis of ‘slow’ to ‘fast’ (e.g. Dunkel, Summerville, Mathes, & Kesslerling, 2014; Giosan, 2006). Many of these behaviours have no obvious connection to growth, reproduction or somatic maintenance, and this sense of ‘life-history theory’ does not follow in a simple way from the first sense (described above). Our explanation for the BCD suggests that some of these behaviours might be correlated due to common ecological drivers more than due to shared biological mechanisms. We also note that the questionnaire scales measuring this putative continuum often conflate potential causes of behaviour with the behavioural responses themselves. For example the “mini-K” scale of the

Arizona Life History Battery (Figueredo, 2007) measures agreement with statements of experience such as, “*While growing up, I had a close and warm relationship with my biological mother*”, in sum with self-reported behaviours, such as “*I avoid taking risks.*” Thus, the construct validity and conceptual utility of such scales can be questioned (Copping, Campbell, & Muncer, 2014).

Still a third sense of ‘life history theory’ is the idea that particular childhood experiences lastingly calibrate adults’ behavioural strategies (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Griskevicius, Tybur, Delton, & Robertson, 2011; Hill, Prokosch, DelPriore, Griskevicius, & Kramer, 2016). In our explanation for the BCD, we did not exclusively privilege childhood experiences or irreversible developmental plasticity. Our account is compatible with day-to-day ongoing experience of low SES in adulthood playing a large role in the behaviours of the BCD. Thus, we did not wish to identify our account with ‘life-history theory’ in this sense, although our account does not need to conflict with it either. In summary, all three senses of life-history theory have potential relevance to our proposed explanation for the BCD but, given the various uses of the term, to have used it as a descriptor of our account would have been to invite confusion about precisely what we were claiming.

R2.3 We didn’t claim that the BCD is adaptive, rational, logical or optimal

Our target article included a section (8.4) entitled “The BCD isn’t necessarily adaptive and perceptions aren’t necessarily accurate.” Nonetheless, many of our commentators have used the word “adaptive” in relation to the BCD (**Bialek & Reddy; Brown & Olding; Gassen et al.; Grossmann & Varnum; Jones; Quinlan; Rad & Ginges; Rickard; Robinson & Piff; Uggl**a). Meanwhile, others have used the word “rational” (**Carmel & Leiser; Doebel, Michaelson & Munakata; Novakowski & Mishra; Srivastava & Srinivasan**), assuming that this is what we meant by saying that BCD behaviours could be seen as contextually appropriate.

However, we actively avoided using terms such as “adaptive”, “rational” and “logical” in our target article because these words have very specific (though sometimes multiple) meanings, which we did not wish to evoke.

To say that a behaviour is “adaptive” in the evolutionary sense is to suggest that it maximises Darwinian fitness. As we outlined in the target article (section 8.4), it is plausible that the tendency to prioritise more immediate outcomes over delayed ones given certain environmental contexts may have been adaptive in ancestral environments. However, any psychological mechanisms we have for making such decisions evolved to deal with cues, and cue-world mappings, that are potentially different from those faced in contemporary societies. Various features of our current environments may skew perceptions and behaviour away from what is strictly adaptive. Indeed, the commentary by **Lewis & Lewis** gives a more detailed account as to how maladaptive behaviours might arise as a non-functional by-product of adaptive mechanisms. The commentary by **Rickard** is also relevant here, as it outlines how the ability to accumulate capital to the advantage of one’s descendants is a relatively new phenomenon, meaning that responses to this possibility may not be adaptive in the Darwinian sense.

We also avoided describing BCD behaviours as “rational” because this might imply that the behaviours ought to maximise utility. This assumption of rationality is one that we are accused of making in the commentary by **Carmel & Leiser**, who state that, “*The “poor but neo-classical” approach treats poor people as utility maximizing agents, and focuses on the structural constraints that affect decision-making as a consequence of reduced opportunities and incomplete information...*” **Carmel & Leiser** are close to the truth in saying that we present an evolutionary take on this line of thought. However, we do not assume that people are necessarily operating as utility-maximising agents any more than they are fitness-maximising

agents—hence our description of the BCD as contextually appropriate, rather than rational or adaptive.

We also chose not to use the term “logical” to describe the BCD because, for some, this term could imply a consciously-reasoned decision-making process. As we discussed in the target article (section 4.1), the BCD may be delivered by both reflective and automatic psychological processes. That is, the mechanisms underlying the BCD need not always involve conscious reasoning.

Having discounted the use of the words “adaptive”, “rational” and “logical”, we were forced to contemplate alternative terms. We decided against the use of the word “optimal” because it provokes thoughts of the sort of fitness- and utility-maximising models that led us to avoid using the words “adaptive” and “rational”, and also because, to some of our readers, it might imply a value judgement about whether a given behaviour was socially desirable. Left with a somewhat constrained vocabulary available to us, we settled on “contextually appropriate”. We hoped this term would convey the idea that BCD behaviours are understandable given the contexts in which they are expressed, without implying that they *necessarily* maximise current fitness or utility, involve conscious reasoning processes, or should be valued differently to other behaviours. The exact entailments of a claim of “contextual appropriateness” are, we admit, rather underspecified, given that it does not necessarily mean utility- or fitness-maximising in the current environment, nor consciously thought-through. Instead, the notion of contextual appropriateness must ultimately be grounded in the normal functioning of context-dependent psychological mechanisms in response to particular classes of environmental experience (**Lewis & Lewis**). Further theorizing of what exactly contextual appropriateness means is required if, as **Brezina** and **Lewis & Lewis** suggest, the term is to become a useful explanatory one for social issues.

R3 Genetic confounds and the concept of plasticity

Most of our commentators have either broadly supported the ideas presented in our target article, or have objected to specific facets of our perspective. **Sherlock & Zietsch** challenge its core assumptions more directly. At a conceptual level, they contend it is invalid to deploy arguments about behaviour being tailored to the environment when explaining differences between individuals of the same species. When comparing species, there is a mechanism (natural selection on genes) that tailors the species' typical behaviour to its typical environment. Within a species, they argue, "*there is no equivalent process that differentially tailors each individual within a species to their personal environment*". Hence, they argue, there is no reason for thinking that different individuals of the same species but faced with different environments should be able to behave in contextually appropriate ways.

We are somewhat surprised by this claim. Individuals growing up in Hungary acquire Hungarian and become skilled at driving on the right-hand side of the road, whereas individuals growing up in England do not. This is tailoring to the local environment. There are many well-understood processes that contribute to such tailoring, which is generally referred to as plasticity. A few obvious examples are: tanning, habituation, imprinting, classical conditioning, reinforcement learning and developmental induction; and this is not an exhaustive list. In some cases, the functional design and mechanistic basis of these adaptations have been described in great detail. Of course, their existence is itself the outcome of the deeper Darwinian genetic process that produces differences (including differences in plasticity) between species. Nonetheless, there is no question that they exist and that their function is to differentially tailor individuals to their personal environments. Thus, there is a plethora of mechanisms available by which the behaviour of individuals becomes contextually appropriate

to their local environments. Some combination of such mechanisms is, we contend, at least partly responsible for the behaviours of the BCD.

On the empirical side, **Sherlock & Zeitsch** point out that much of the evidence we cite is correlational. As such, it could equally well be explained by genetic associations between socioeconomic and psychological variables. We acknowledge that this is a major issue, and did concede that this is so in section 8.5 of the target article. To disentangle genetic correlations from environmental causes is one of the main challenges in this area. Our account requires, not that genetics makes no contribution to the association of SES and behaviour, but that the causal impact of the environment, via plasticity of some form, makes at least some contribution. We agree that this needs to be established more definitively. We reiterate the conclusion of section 8.5: that more experimental research is needed. Ultimately, only the experimental method can definitively evaluate causal claims about environmental factors. As such, we welcome the recent turn towards large-scale randomised control trials in social science (Duflo & Banerjee, 2011), as well as the various ingenious ways psychologists have developed to experimentally manipulate environmental experiences (e.g. Kidd, Palmeri, & Aslin, 2013).

R4 Welcome extensions of our ideas

A number of our commentators have proposed useful extensions of, or additions to, the ideas we presented in the target article. We are grateful to them for adding their ideas and, in some cases, providing new interpretations of the perspective we have presented. In this section, we highlight and discuss these valuable contributions.

R4.1 *The BCD as a risk management strategy*

In the target article, we focussed on temporal discounting as a core concept connecting the BCD behaviours, which we suggest are driven by the experience of uncontrollable future-

limiting factors. We touched briefly on the concept of risk acceptance (defined as a willingness to accept options associated with variable outcomes over less-variable options of equal expected value), noting that the contextually appropriate response perspective does not, without further assumptions, make *predictions about* this form of risk acceptance. However, as we mentioned in the target article, and as the commentaries of **Jones, Mell, Baumard & Andre**, and **Amir & Jordan** point out, evidence suggests that preferences for immediate rewards are driven by the inherent uncertainty of future outcomes (Andreoni & Sprenger, 2012; Weber & Chapman, 2005). That is, temporal discounting is a response to perceived collection risk (**Mell, Baumard & Andre**).

Amir & Jordan make the excellent suggestion that temporal discounting can be conceptualised as a risk management strategy, in which people respond to uncertainty by becoming more present-oriented. They point out that, by conceptualising the BCD as a risk-management strategy, we can more parsimoniously account for both behaviours involving temporal trade-offs, and those involving risk and social preferences. As motivation for risk aversion at lower SES, **Amir & Jordan** highlight the marked effects of fluctuations in resource availability for those living in deprivation, “...*while small and moderate fluctuations in resources (income, calories, etc.) are unavoidable, only those at the margins feel the full effects of such fluctuations and consequently must be more attentive to variability in the environment and the downside risk of their decisions.*” Conceptualising the BCD as a risk management strategy, as **Amir & Jordan** suggest, results in a more inclusive BCD, thus offering a more comprehensive framework for understanding socioeconomic variation in behaviour (and thereby addressing some of the concerns expressed by commentators regarding the restricted range of behaviours considered in the BCD – see section **R1.1**). For example, it might allow us to accommodate **Robinson & Piff** and **Pearson & van der Linden’s** suggestions that

prosocial behaviours among lower-SES individuals are a strategy to increase personal control to buffer against external threats.

Conceptualising the BCD as a risk-management strategy also allows us to account for the role of unpredictability, as suggested by **Gassen et al.**, and by **Mittal & Griskevicius**. As **Gassen et al.** point out, both actual and perceived control are reduced when outcomes are unpredictable, and unpredictability is greater in lower-SES environments. Further, as **Srivastava & Srinivasan** emphasise, lower-SES people more frequently operate close to budgetary boundaries, meaning that unpredictable changes in circumstances have more severe consequences. Nonetheless, as stated by **Mittal & Griskevicius**, *“Harshness and unpredictability might have distinct effects because the adaptive methods to deal with a consistently harsh environment are different than the methods to deal with a rapidly changing and inconsistent environment.”* Therefore, more empirical work is needed to establish whether harshness and unpredictability produce distinct effects, or whether these are different factors that produce similar-looking consequences. Fortunately, Frankenhuys, Gergely and Watson (2013) have provided a developmental theoretical model suggesting that harshness and unpredictability produce distinct contingency profiles, and providing testable predictions about the maturation of infants under these conditions. Such models provide a useful starting point for devising empirical tests and improving our understanding of the effects of different environments.

The commentary by **Mell, Baumard & Andre** also contributes to our understanding of the BCD in terms of risk management. They suggest that, while we have explained the BCD in terms of the collection risk associated with future rewards, we should also consider the costs of waiting for future rewards, even when the future rewards are guaranteed. They provide some excellent examples of situations in which waiting would not be contextually appropriate

because the costs of waiting outweigh the rewards of doing so. For example, they present the following thought experiment: “...*imagine a farmer who participates in an economic study in which he is offered a choice between 1000\$ now or 2000\$ in a month. Because this particular farmer does not own any expensive agricultural equipment, he is only able to sow half of his fields simultaneously. However, 1000\$ now would allow him to buy new equipment and exploit his whole farm. This would yield him an expected 2500\$ increase in revenue by the end of the month. Hence, our farmer should prefer the smaller-sooner reward even though the collection risk in our example could be close to zero and the larger reward is only delayed by a month. Instead, it is the fact that his current level of capital is associated with a particularly high opportunity cost in productivity that determines his choice.*” In this manner, the commentary by **Mell, Baumard & Andre** gives several clear accounts of ways, other than collection risk, in which economic deprivation may increase the value of more immediate rewards.

On a similar theme, **Sear & Schaffnit** called for an increased focus on the costs and benefits of behaviours in the present. They suggest that “...*the costs and benefits of behaviours in the present differ by environmental context; and also that it is not just the size of the present versus future reward that matters, but that the costs and benefits may also be realised in different currencies in different environments.*” Because of this, **Sear & Schaffnit** emphasise, we cannot always simplistically characterise the decisions that people face as smaller-sooner versus later-larger rewards. Sometimes the payoff in the present is the larger of the two, or it is in a favoured currency, in which case patience *still* doesn't pay. They illustrate this idea with the example of investment in education. In the target article, we suggest that it is less beneficial to invest in education if you are unlikely to reap much reward from it later in life. **Sear & Schaffnit** add that there may be benefits to lower-SES individuals of leaving school early—including immediate earnings, but also opportunities to gain other skills, which may be more

valuable in their context. In this sense, the additions offered by **Sear & Schaffnit** tie in with those of **Mell, Baumard & Andre**, who emphasise the effects of opportunity costs.

Collectively the commentaries we have reviewed in this section make a compelling case for viewing the BCD as the behavioural result of strategies for managing risks, costs and benefits under conditions of limited resources as well as limited control. This perspective is not incompatible with the one we presented in the target article. Rather, it is a superordinate explanation, which allows us to parsimoniously account for a broader constellation of behaviours, including those involving temporal trade-offs. As such, it is a welcome extension of the perspective we presented, and one that we wish to champion.

R4.2 The physiological constellation of deprivation

In our target article we suggested that socioeconomic inequalities in life expectancy could be understood as resulting from a combination of differential extrinsic mortality risk and the intrinsic mortality risk it causes via a double disinvestment in both behavioural and physiological investments in health. In response to this, **Garcia & Blackwell** have suggested a subtly different perspective to our concept of physiological disinvestment: that *“development in a deprived environment may lead to not just disinvestment in repair and immune mechanisms, but also lead to investment into alternate kinds of immune defense and repair.”* They go on to explain how the increased pro-inflammatory responses associated with experiences of early-life stress, *“...might represent a predictive adaptive response that evolved in ancestral environments in which uncertainty was coupled with greater risks of injury and illness.”* They explain that this innate, more general, inflammatory response is quicker and cheaper to establish than more specific adaptive (in the immunological sense) responses, which take time to develop. They suggest that the costs and time required to generate a more specific

immune response mean that a stronger innate immune response may be preferred when time is short.

In the sense that it is focused on *differential* investment, rather than *disinvestment*, **Garcia & Blackwell's** perspective has something in common with the strengths-based approach suggested by **Frankenhuis & Ellis** (see **R4.3** for further discussion of this). We applaud this suggestion as it moves thinking away deficit models and more firmly in the direction of contextually appropriate allocation of resources.

Relatedly, **Brown & Olding** discuss the epigenetic processes that might underlie the behavioural and physiological constellations of deprivation. They propose that the costs and benefits of the various possible contextually appropriate responses to environment are moderated by age, and that DNA methylation profiles might act as an epigenetic clock, regulating such responses in line with age.

R4.3 Taking a more strengths-based approach

In our target article we advocated moving away from using purely deficit-based thinking regarding the behavioural effects of deprivation. We emphasised that we view the present-oriented behaviours of the BCD as a contextually appropriate response to structural and ecological factors, rather than pathology or a failure of willpower. Yet, the responses of our commentators suggest to us that, perhaps, we didn't go far enough. **Frankenhuis & Ellis** go a step further to promote a strength-based approach, suggesting that, "*Contextually appropriate responses may also include the development of enhanced skills and abilities that are ecologically relevant in harsh-unpredictable environments.*" They explore the potential effects of people adapting to stressful environments, highlighting that people from unpredictable environments may become better able shift attention between tasks, or to track novel information. They also underscore the implications of taking a fuller perspective that

acknowledges the strengths developed by people who have experienced various adversities. They conclude that understanding the enhanced skills and abilities developed in environments of deprivation could allow us to design classroom and work-training environments that work with, rather than against, the strengths of stress-adapted people.

Related to the call from **Frankenhuis & Ellis** to focus on the strengths developed by people in harsh and unpredictable environments, several commentators have emphasised the socially desirable behaviours that are more common in lower-SES communities. For example, **Robinson & Piff** review the prosocial tendencies that are more common amongst lower-SES individuals, suggesting that “*cooperative communities may provide a form of “collective control” over threatening environments.*” **Srivastava & Srinivasan** cite the charitable behaviour observed from lower-SES individuals and call for a greater focus on such positive behaviours. Similarly, **Pearson & van der Linden** focus on environmental concern as an example of a socially desirable attitude, which they say is stronger amongst economically disadvantaged groups (although cf. Gifford & Nilsson, 2014). We chose not to focus on these behaviours in our BCD, because they were not so straightforwardly joined by the conceptual threads of low control and temporal discounting as the other behaviours. However, we certainly did not wish to paint a negative picture regarding those behaviours that are more frequently seen at lower SES, and we agree that it is important to emphasise the socially desirable traits and abilities that are more common in lower-SES people.

R4.4 *Early-life learning experiences are beyond control*

In our target article, we proposed that limited control over future outcomes should be a driving factor of the BCD. We also outlined some ways in which the effects of early-life adversity could become embedded and amplified through feedback loops (section 3.2 of the target article). However, we did not emphasise the fact that early-life experiences, especially

for altricial species, are beyond individual control. This idea is highlighted in the commentary by **Kurkul & Corrieveau**, who discuss how early learning experiences are beyond individual control and consequently may contribute to the BCD. They describe how lower-SES children have fewer opportunities to engage in new activities that help them to acquire information, creating inequalities in conceptual knowledge and information-seeking behaviours, which are then reinforced by feedback loops. As **Kurkul & Corrieveau** put it, “*A virtuous cycle of learning occurs for children who have access to the type of numerous, rich, and varied experiences that support acquisition of knowledge about the world...*” They propose that, for those who don’t have access to such rich early learning opportunities, the potential for later educational success is constrained: as we said in our target article, constraints breed constraints.

R4.5 Additional routes for intergenerational transmission

In section 4.4 of the target article we briefly touched upon the possible biological mechanisms by which stresses and disadvantages may be passed down through generations. **Rickard** helpfully expands upon this picture in his discussion of the pathways by which various forms of capital may be intergenerationally transmitted. He also explains that the evolutionarily novel complexity of our societies and their varied routes for transmission of capital may mean that behavioural responses to having capital (or lack thereof) are maladaptive—another reason for us to label the BCD a contextually appropriate response, rather than an adaptive one (see section **R2.3**).

Relatedly, **Bialek & Reddy** extend our discussion of the intergenerational transmission of disadvantage through biological mechanisms (section 4.4 of the target article) to include what infants learn about the world through their parents. They list a number of ways in which patterns of temporal discounting may be transmitted intergenerationally via social learning

mechanisms (an intergenerational case of the social learning processes we discussed in section 4.3 of the target article).

R5 Welcome considerations of the policy implications of our ideas

In addition to suggesting some excellent extensions to our target article (see section **R4**), our commentators have done an admirable job of drawing out the implications of our perspective for ethics, policy and practice. We welcome these explorations and take this opportunity to emphasise their key conclusions.

In her commentary on the ethical implications of our perspective for policy making, **Chevallier** notes the inherent bias in social class amongst policy makers. She stresses that the majority of policy makers originate from high-SES backgrounds and therefore tend to place value on behaviours that would be appropriate within the contexts they have experienced. She uses the example of teen pregnancy, proposing that 2 key assumptions are often made: “*1) early pregnancies are not chosen and women would delay childbearing if provided adequate family planning options 2) early childbearing is one of the main reasons why many women from poor backgrounds drop-out of school, thereby depriving themselves of adequate training and ultimately of opportunities to earn decent wages.*” **Chevallier** challenges both of these assumptions, providing evidence to suggest that they do not hold: that many young women *choose* to reproduce relatively early, and that early childbearing doesn’t much alter the eventual wage-earning power of women in lower-skilled jobs. **Chevallier’s** commentary provides a superb example of how thinking about contextually appropriate responses could help us to avoid imposing our own preferences upon others in misguided attempts to encourage them to make “better” choices.

Chevallier’s sentiment is echoed in the commentary by **Freese**, who warns of the dangers of viewing a scientific problem from the biased perspective of many policy makers.

He argues that, from an evolutionary perspective, it is the behaviour of higher-SES individuals that appears peculiar, and that *“We should not treat the behaviors of the affluent as providing the natural baseline from which different behaviors by low-SES people are to be explained.”*

Freese may well be correct in asserting that we should frame our scientific questions from the perspective of trying to explain what he calls a “behavioural constellation of advantage” rather than focusing on lower-SES behaviours. However, we must also acknowledge that the relevance of academic research for the wider world is judged in part by its usefulness in solving policy problems—even if we question whether some of the behaviours policies aim to prevent should be viewed as problematic at all.

Perhaps a conclusion we might draw from the commentaries by **Chevallier** and **Freese** is that policy makers should be less paternalistic. However, **Adams’** interpretation of the implications of our perspective suggests that this would be too simplistic. **Adams** examines the implications of the contextually appropriate response perspective for public health interventions. She discusses the concept of “low agency” interventions—schemes which do not rely on recipients using their own resources to engage with them. She argues that low-agency interventions such as increasing the financial availability of healthy food might not actively engage the recipients, but can still increase their control over their diets. **Adams** discusses the common misperception that low-agency interventions curtail individual choice, arguing that they can actually increase individual control—something which our perspective suggests would be beneficial.

Indeed, an interesting case study in our local area, Newcastle upon Tyne, found that neighbourhood renewal efforts (a form of low-agency intervention), including improvements in local housing security and road safety, led to a sharp decline in smoking amongst residents (Blackman, Harvey, Lawrence, & Simon, 2001). As we discussed in our target article (section

6), this is one way in which our perspective makes different predictions to other attempts at understanding and modifying health behaviour. Whilst many models presume that smoking-specific campaigns are needed to decrease smoking, our perspective suggests that a reduction in uncontrollable mortality risks more generally should increase the incentive for healthy behaviour in all domains. Improved neighbourhood safety may not seem like an immediately obvious way to encourage people to stop smoking or improve their diets. However, we predict that meaningful reductions in risks beyond individual control should increase people's incentives to reduce the risks that *are* within their personal control through healthier behaviour.

In his commentary, **Brezina** transfers some of our conclusions about the potential unintended consequences of fear campaigns in public health to the domain of interventions in criminology. In section 6.1 of the target article, we discuss how the contextually appropriate response perspective alters our predictions regarding the effects of fear appeals (campaigns intended to change behaviour by inducing fear of health threats). We suggest that fear appeals might fail to change health behaviour if their recommendations for mitigating specific risks only offer people small risk reductions against high background mortality risk. **Brezina** translates this logic to the “Scared Straight” program in the United States, which aims to reduce juvenile offending by highlighting the horrors of prison life. Such programmes have been found to *increase* offending, and Brezina suggests that this may be because they increase pessimism about the future, thereby eliciting more present-oriented behaviour. He advises that interventions offering optimistic future prospects (providing offenders with a realistic positive alternative to the bleak futures they might otherwise expect) have been more successful than their punitive counterparts. We are very pleased to see our perspective translated for those working in criminology and very much hope that Brezina is correct in his assertion that, “...*CARP will help us to better understand why programs often produce unintended effects—an understanding that could lead to more effective and humane interventions...*”

R6. Conclusion

In conclusion, many of the commentaries regarding our proposed BCD and its causes and consequences have helped us to further extend and explain the ideas put forward in the target article. In some cases, commentators seem to have misunderstood our perspective and their comments have offered us the opportunity to make the necessary clarifications and tackle common misperceptions (for example, that the BCD is necessarily adaptive, or that we would characterise it as a “life history strategy”). In other cases, commentators have extended or modified our ideas in ways that make them more powerful (for example, by suggesting that we conceptualise the BCD as a risk management strategy, or by outlining a potential Physiological Constellation of Deprivation). Other commentators have added richness to the picture by discussing additional mechanisms that might underlie the effects of future-limiting factors (or extrinsic risks, if we are to conceptualise the BCD as a risk management strategy) on BCD behaviours. Finally, some commentators have offered valuable discussions of the important potential implications of our ideas for ethics, policy and practice, raising interesting research questions in the process. We are grateful to have had this opportunity to receive such comments as they have helped us to clarify, expand, modify, enrich, and better understand the implications of, our original ideas.

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