Trends in Cognitive Sciences

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Letter

# Autism and intolerance of uncertainty: an ill-fitting pair

Jo Bervoets,[1,2,3] Damian Milton,[4] and Sander Van de Cruys[2,3,5,*]

We applaud the efforts by Stark and colleagues [1] to chart how a predictive processing account of autism may lead to autistic anxiety. We wholeheartedly agree that this is a productive route to shed light on a real problem in autism and that this kind of dialogue is much needed in a field that has been plagued by dogged misconceptions, with sometimes harmful consequences, for autistic people. Stark and colleagues provide an example of how lived autistic experiences of, for example, anxiety, can be scientifically validated by sound theories about a different cognitive (predictive) processing profile. At the same time, it illustrates how new misconceptions could take hold if old concepts like 'intolerance of uncertainty' are not sufficiently scrutinized with state-of-the-art theoretical tools (c.q. predictive processing in autism). To preempt future misconceptions, we clarify the concept of 'intolerance of uncertainty' here and show that it does not fit well within a predictive processing framework.

Intolerance of uncertainty is a personality construct that emerged in the 1990s [2] to indicate the emotional (over)reaction people may experience when confronted with unpredictable situations. Based on a self-report scale, it is used in a similar sense to allergic or digestive (over)reactions. For example, in lactose intolerance the same amount of milk may create an extreme physiological (immune) reaction in some, but not in other individuals. But the parallel already breaks down here. Psychological stimuli are fundamentally different from allergens. One cannot isolate stimulus 'uncertainty' like one can isolate an allergen. Indeed, the lesson from predictive processing is that uncertainty is a subjective and a contextual variable. It is subjective because each of us has built different expectations (priors) against which prediction errors are generated. It is contextual because each situation, or goal, calls for seeing different things (different 'errors') as relevant, or salient.

Stark and colleagues [1] refer to 'attenuated predictions', but this is an ambiguous formulation that sidesteps the crucial issue of how predictions and prediction errors are weighted in perceptual inference and learning. This is where the concept of estimated precisions becomes critical: these are second-order predictions about the relevance and reliability of (first-order) prediction errors that regulate whether those prediction errors are treated as noise (variability that is unlikely to repeat or matter to the task at hand), or as signal (differences about new or altered regularities that require new learning). It is this fallible, context-dependent process of uncertainty estimation and refinement that is affected in autism, according to predictive processing accounts [3,4]. Therefore, before making claims about 'intolerance of uncertainty', the nontrivial task of uncertainty estimation and partitioning (into estimation uncertainty, expected uncertainty, unexpected uncertainty or volatility [5]) needs to be explored.

While giving a low weight to some prediction errors (e.g., when reading a text) often allows information to be processed and generalized more efficiently (e.g., disregarding typos and focusing on the text's meaning), some tasks require that prediction errors receive more weight in order to tightly fit specific predictions with the stimulus (e.g., as required in proofreading). Because of the difference in salience given to prediction errors, one could say autistic people are more sensitive to prediction errors (the source of uncertainty in the long term), in the sense that they are less likely to suppress them across the board. Consequently, autistic people will tend to create more uncertainty because of their heightened attention to prediction errors, showing that intolerance of uncertainty is really a misnomer here. In fact, the overarching idea of predictive processing is that we, autistics and neurotypicals alike, are all 'intolerant' of uncertainty: indeed, the mind is fundamentally geared towards the minimization of uncertainty [6]. The difference lies in the salience mismatch between autistic and non-autistic people where, through different developmental trajectories, autistic people tend to shape their environment more tightly so as to preempt avalanches of prediction errors [7]. This may give rise to restricted behaviors [7] and the spiky interests as proposed by the monotropism account [8]. It also helps to explain why environments built by and for neurotypical people tend to provoke anxiety in autistic people.

In sum, the mechanism of anxiety is the same in non-autistic and autistic people but the very source of uncertainty provoking it is different to begin with. Uncertainties are not objective (and equal) but coconstructed by world and mind, which renders the framework of intolerance of uncertainty a bad fit with predictive processing accounts of autism. Whereas intolerance of uncertainty casts autism as an emotion regulation problem (Box 1), a predictive processing account instead points to difficulties in tracking and controlling uncertainty, resulting in different environmental preferences. Rather than painting autism as inherently disordered, our analysis shows that an overly anxious state is a potential but not an essential outcome of autism [9].

### Box 1. The typical mind fallacy and the double empathy problem

The 'typical mind fallacy' (William James) or 'mind projection fallacy' [10] is the tendency to assume that the structure of another person's mind (or the typical person) is the same as your own. It is particularly strong for domains such as perception, which allegedly give us access to the bedrock veridical structure of the world, untainted by our preconceptions (the online commotion around bistable phenomena like 'the dress' attests to this). Applied to intolerance of uncertainty, the assumption that uncertainty is an objective 'given' leads to the faulty conclusion that someone is being irrationally oversensitive ('intolerant') to the same 'inputs'. The failure to imagine how the world is experienced by autistic people creates a faulty attribution of inappropriate emotionality. The whole discussion can thus be viewed as an incarnation of the 'double empathy problem' [11]. Notice that this renders the oft-used parental version (instead of child/self-report) of questionnaires especially problematic (a parent will see the meltdown but not have the child's models/uncertainty/data). More generally, an attitudinal scale can only say so much, the real tests will have to come from laboratory experiments using controlled inductions of uncertainty and computational modeling to see whether those uncertainties are tracked and used similarly in autistic and typical participants [12].

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[1]NeuroEpigenEthics, Antwerp University, Antwerp, Belgium
[2]Laboratory of Experimental Psychology, KU Leuven, Leuven, Belgium
[3]Leuven Autism Research (LAuRes), KU Leuven, Leuven, Belgium
[4]Tizard Centre, University of Kent, Kent, UK
[5]Antwerp Social Lab, Antwerp University, Antwerp, Belgium

*Correspondence:
sander.vandecruys@uantwerpen.be (S. Van de Cruys).

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