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Editorial: Camouflage and autism

The theme of camouflage recently gained unexpected momentum in autism research. Symposia and panel discussions are devoted to 'camouflage' in autism conferences. Because of its association with intended deception, the term camouflage has poor fit with the autism world. However, psychopathologists have a long tradition of resorting to camouflage-like terminology, from Freud's reaction formation, to pseudoschizophrenia, to Winnicott's false self, to masked depression, and even to the recent quasi-autism, artfully telling us that what we see is actually not what we see but rather what we cannot see. Is 'Camouflaged Autism' the next in line nosographical pearl?

What is camouflage or camouflaging? The term refers alternatively to the subjective experience of autistic individuals trying 'to put his/her best normal' (Hull et al., 2017), the actual behaviors employed to fit in one's social environment, the associated cognitive process, or the end stage of being successfully camouflaged. The term polysemy makes it difficult to pinpoint a clearly demarcated construct common to all studies. Other terminologies (the 'compensation profile') refer to a largely overlapping phenomenon. Hull et al. (2017)'s qualitative study produced the most actionable definition: a combination of masking (e.g., hiding autistic behaviors that stand out socially) and compensating (making up for social-communicative deficits) behaviors that are recruited, consciously or not, in one individual's repertoire in order to improve his fit within a particular environment. Therefore, in its most prosaic form, camouflage is no more than a coping strategy used by vulnerable individuals to improve their social adjustment. As such, camouflage is a downstream consequence of autism more relevant to its long-term outcome than to its emergence and early development. Importantly, this formulation emphasizes that camouflage is not an intrinsic feature of autism *per se*; rather, it is transactional in nature and characterizes a personXenvironment adaptive process. Camouflage is best studied at the interface between an autistic subject and his ecological niche, and does not singularly measure or define autism.

The operationalization of camouflage in studies has been variable. One approach consisted of differencing autism scores from self-reported questionnaires and professional observations (Lai et al., 2017; Schuck et al., 2019). The discrepancy between the 'true' self-reported autism status and the behavioral display measured by an external observer (e.g., an ADOS score) represents, presumably, a measure of camouflaging. There are several serious problems with this discrepancy approach. First, there is little evidence that a self-reported autism score is the most valid measure of autism in a given individual with autism; likewise, it is unclear that a brief office-based ADOS session provides an appropriate context to best evaluate camouflaged autistic behavior. Second, a linear combination of two scores measuring the same construct should result in another index of the same construct, not a measure of a new construct. To provide a simple medical analogy, consider the difference between ideal body weight and actual body weight; the difference, also measured in pounds or kilograms, cannot be equated to a measure of weight (dis)satisfaction or of dieting behavior. Third, the use of a multitrait multimethod paradigm makes it impossible to separate the true score from systematic measurement error. Lastly, no study provided an independent demonstration that this discrepancy score was a true measure of camouflage. Various correlations to external criteria are no evidence for construct validity. Alternative approaches resulted in two ad hoc questionnaires. However, in a preliminary study of the 25-item Camouflage Autistic Traits Questionnaire total score (CAT-Q; Hull et al., 2019), correlations with a social anxiety measure were as high or even higher than those with an autism measure, suggesting confounding by co-occurring social anxiety as further illustrated by some item content (e.g., 'I am always aware of the impression I make on other people'). Confounding effects of co-occurring psychiatric symptoms were unfortunately ignored in subsequent CAT-Q analyses (Hull et al., 2020; Jorgenson et al., 2020). In addition, masking subscale scores failed to differentiate autistic and nonautistic participants (Hull et al., 2020) and were even significantly higher in controls compared with autistic participants in Jorgenson et al.'s study. Testing the 31-item Compensation Checklist, Livingston et al. (2020) only found 1 of the 4 compensation strategies to differentiate, weakly, autistic and nonautistic participants.

Camouflage studies have been conducted with small convenience samples of autistic teenagers and adults. Recruitment through social media, advertisements, word of mouth, the Internet, or existing registries yielded atypical samples comprising unusually high proportions of females diagnosed late in adult life (Hull et al., 2020; Livingston et al., 2020). With no systematic sampling and no report of participation rates, the samples' representativeness is simply unknown. Higher levels of camouflage in autistic females compared with males have been reported in some (e.g., Jorgenson et al., 2020; Lai et al., 2017) but not all (Livingston et al., 2020) investigations, but owing to the inconstant inclusion of a nonautistic control group, it is difficult to know

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whether these sex differences are specific or not to autism. Because camouflage measures were derived from small, predominantly female, samples, it is also possible that more specifically male camouflaging strategies were not yet identified and surveyed. Although potentially negative emotional costs associated with female camouflaging were reported in qualitative studies, quantitative studies did not consistently report an association of camouflage with lesser well-being or increased anxiety or depression (Hull et al., 2019; Schuck et al., 2019). Finally, participation in camouflage studies required high literacy skills and intelligence levels that seriously limit their generalization.

The specificity of camouflaging with respect to autism has not been established as studies have not included nonautistic clinical control groups. In various chronic health and psychiatric conditions (e.g., obesity or social phobia), patients might experience similar pressure to blend in their social environments and consequently deploy compensating, masking, and other coping strategies. Small or inexistent differences in mean camouflage scores between nonautistic controls and autistic participants (Hull et al., 2020; Jorgenson et al., 2020; Livingston et al., 2020) raise a further question: what are controls camouflaging, and why? Finally, camouflage studies have relied on qualitative or cross-sectional designs, one study tested age effects (Jorgenson et al., 2020), and no study examined camouflage trajectories in longitudinal studies. Since camouflage has been described both in diagnosed and undiagnosed (especially female) autistic individuals, establishing the relevance of camouflage to diagnostic status requires therefore its examination in prospective studies of both diagnosed and undiagnosed autistic participants.

Despite the limited quality of data at hand, camouflage discussions often entail the claim that there exist a large number of undiagnosed autistic females, raising two issues. First, in virtue of their study design, camouflage studies could not estimate the prevalence of undiagnosed, truly autistic, female adults. In the absence of advancing knowledge on this question, such speculations should be dampened. Second, camouflage studies did not even confirm independently diagnoses of their participants whether ascertained by a high score on a self-report questionnaire or by prior unverified community diagnoses or by self-declared autism. Validation of the diagnosis of participants in such studies is a future imperative.

Issues of adult diagnosis are beyond the scope of this Editorial, but two aspects are considered here. First, with its destigmatization, a common lay concept of autism reduces autism to a simplified trait or (neuro)psychological characteristic (being weird or quirky, a 'nerd' or a loner, etc.), almost akin to a personality style. Adult outcomes of several psychopathological syndromes include constellations of relationships and communication difficulties, repetition and rigidity, rumination and reduced interests, and broad functioning impairment, a final common pathway that can be mistaken for (simplified) autistic traits and erroneously mapped onto autistic trajectories. For example, reduced eye contact, social awkwardness, and a preference for being alone are overlapping symptoms of autism and social anxiety disorder. The principle of equifinality whereby different atypical child developmental trajectories may converge toward similar adult outcomes makes the task of autism diagnosis in adults exquisitely difficult and requiring more advanced skills and expertise in differential diagnosis that is necessary with young children. Reliance on autism tools such as the ADOS Module 4 is insufficient even when administered by 'research level reliability' trained staff. As it has now been abundantly shown, scores of both questionnaire and diagnostic tools commonly used in autism research are seriously confounded by co-occurring psychiatric symptoms, including ADHD, anxiety, and mood problems (e.g. Havdahl et al., 2016). Evidence exists that the ADOS Module 4 has reduced specificity in adults when administered in the context of co-occurring schizophrenia, bipolar, or mood disorders (Matsuo et al., 2015). Thus, pretty much as we require a language and cognitive assessment in diagnostic evaluations of young children, assessment of adults should include detailed measurement of adult psychopathology in order to correctly interpret the results of autism-specific instruments. This is equally true for dimensional and categorical–diagnostic measurements.

Second, confirming adult diagnoses in camouflage and other studies necessitates demonstration of an atypical developmental trajectory in early life consistent with autism being a neurodevelopmental disorder with an early onset. Because caregivers may no longer be available, researchers should develop new diagnostic evaluation paradigms for adults, combining direct observation with noncaregiver informant interview, reviews of medical and educational records, of work and social history, and perhaps viewing of familial video archives, in order to establish more firmly the validity of late ASD diagnoses. Removal of the age of onset criterion in DSM 5 does not exempt investigators to establish that 'core diagnostic features were evident during the developmental period'. This requirement is critical in light of the known increased incidence of female-specific psychopathology (anxiety and affective disorders) and adult-onset disorders (bipolar, schizophrenia, personality disorders) during adolescence and the transition to adulthood. Evidence of early childhood abnormalities should be heavily positively weighted toward an autism diagnosis, and conversely. Some may still argue that, owing to successful camouflage and compensation, autistic girls might 'fly under the radar' up to adolescence when increased social demands crumble the camouflage armor. Evidence

that this group (undetected camouflaged autistic girls that survive undiagnosed or late-diagnosed in adult life) exists is not available; onset of adolescent and young adult psychopathology should be entertained as competing explanations for changes in functioning emerging through this developmental period. If such a group existed, it would have been detected in high-risk sibling studies in the form of an early, subthreshold but consequential, broader autism phenotype with female over-representation. On the contrary, female siblings with non-ASD outcomes at age 3 did fare slightly better than males (Charman et al., 2017). And in follow-up in middle childhood, at-risk siblings of both sexes whose diagnosis was missed at age 3 but reached by age 9 had all shown abnormalities at or before age 5 consistent with the evidence of early abnormal developmental trajectories in all diagnosed subjects (Brian et al., 2016).

Female camouflaging alongside an eclectic set of sex differences in autism has fueled the notion of 'female autism phenotype'. But is there ground to crystallize the 'female autism phenotype' as a separate object of investigation as opposed to simply acknowledging sex differences in autism, as expected for any other psychological or biological phenomenon? In order to uncover camouflaged and undetected autistic females, it was proposed to modify diagnostic criteria and autism measures. Symptom profile comparisons between males and females with autism have yielded inconsistent results. Compared with males, females tend to endorse lower levels of restricted repetitive behaviors although the magnitude of these differences is small, whereas differences in social and communicative behaviors or early cognitive skills are negligible (Kaat et al., 2020). Importantly, interpreting sex differences is not as straightforward as it would seem. Some differences may simply mirror differences observed in typically developing children and be therefore unrelated to autism. Within autism samples, sex differences are confounded by background characteristics (intellectual disability, type and level of psychiatric comorbidity, language proficiency) that are differentially distributed across sexes. Unless these are tightly controlled (see Kaat et al., 2020), attribution of differences to the sex of participants may be misleading. Nevertheless, existing studies relied on potentially male-biased instruments and did not include undiagnosed (female, adults) individuals. Thus, lower sensitivity in females alongside gender stereotypes and biases may account for delayed access to diagnosis in autistic females. Should we therefore create gender-specific diagnostic criteria, algorithms, norms, and cut-offs?

Depressed men do not cry as much as depressed women, antisocial females rely on covert rather than overt aggressive behaviors, girls with ADHD tend to have more often the inattentive type, and so on. Yet, no gender-specific diagnostic criteria have been laid out for these disorders, and sex differences are simply documented as annotations to the diagnostic criteria. Yet, sensitivity to particulars of the autistic symptomatology in females could be heightened through inclusion of more female-specific behavioral illustrations in nosography as well as in dimensional measures. However, behavioral exemplars ought also to reflect autism with and without intellectual disability, verbal and nonverbal subjects, toddlers and adults, as well as males and females. On balance, the magnitude of sex differences in autism remains small. Other differences on the ASD spectrum based on level of intelligence or language are associated with much larger differences; stratifying autism samples according to these features is associated with substantial effect sizes and differences in treatment, management, and outcome, in a way that sex differences are not, especially when confounding correlates of sex are fully taken into account.

Further research on camouflage will require more conceptual clarity and a clear differentiation between feelings, experiences, cognitive processing, behaviors, and ultimate predicament of autistic people in real social life situations.

In sum, I have no enthusiasm for 'Camouflaged Autism' as a new ASD subtype. The field of autism has been going around with several unsuccessful attempts to subtype the phenotype in more homogeneous and meaningful subgroups: regressive autism, high- and low-functioning autism, even wandering autism, to name a few. They proved unhelpful and command us to stay resigned to the phenotype heterogeneity. Camouflage is one of several available coping and adaptive strategies that autistic individuals may employ to adjust to their social environment. These coping strategies may comprise camouflaging, with masking (e.g., maintaining eye contact) and compensation (e.g., using scripted language to initiate conversation), alongside other noncamouflaging behaviors. Furthermore, they may not be specific to autism. I note incidentally that most behaviors discussed in camouflage commentaries are precisely those skills that are actively targeted for scaffolding in social skill treatment interventions (although I am not suggesting to rename those interventions camouflaging boot camps!). Further research on camouflage will require more conceptual clarity and a clear differentiation between feelings, experiences, cognitive processing, behaviors, and ultimate predicament of autistic people in real social life situations. Camouflage measures are in their infancy and still require demonstration of fundamental properties, especially of their construct validity. While research on camouflage has merit, camouflage research does not rise to a new ground-breaking area of investigation.

Likewise, I remain skeptical about the claims of a vast underworld of undiagnosed, camouflaged, autistic adult females that would have been ignored. This is not to say that performing measurements with more sensitivity to sex differences in clinical expression would not be beneficial, but, by the same token, improving sensitivity to other differences on the autism spectrum by age, cognitive, verbal, or cultural status should be equally contemplated.

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