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Person Perception, Meet People Perception: Exploring the Social Vision of Groups

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Abstract

Groups, teams, and collectives—*people*—are incredibly important to human behavior. People live in families, work in teams, and celebrate and mourn together in groups. Despite the huge variety of human group activity and its fundamental importance to human life, social-psychological research on person perception has overwhelmingly focused on its namesake, the person, rather than expanding to consider people perception. By looking to two unexpected partners, the vision sciences and organization behavior, we find emerging work that presents a path forward, building a foundation for understanding how people perceive other people. And yet this nascent field is missing critical insights that scholars of social vision might offer: specifically, for example, the chance to connect perception to behavior through the mediators of cognition and motivational processes. Here, we review emerging work across the vision and social sciences to extract core principles of *people perception*: efficiency, capacity, and complexity. We then consider complexity in more detail, focusing on how people perception modifies person-perception processes and enables the perception of group emergent properties as well as group dynamics. Finally, we use these principles to discuss findings and outline areas fruitful for future work. We hope that fellow scholars take up this people-perception call.

Keywords

people perception, person perception, ensemble coding, social vision

An entrepreneur presenting her pitch deck to investors, a local representative addressing his constituents, a teacher entering a classroom full of students—these scenes represent a small swath of people's daily experiences in perceiving other people. From such perceptions arise a multitude of socially relevant questions: Are the investors on board with the idea? Are the constituents angry or pleased? Who are the students in the class? Although it is easy to imagine the entrepreneur seeing the investors' growing excitement, the representative recognizing angry constituents, and the teacher observing the lack of racial diversity, this ease belies the complexity of such perception and subsequent social inference. To assess a plethora of faces by individually perceiving the emotional expression on each face or to categorize and tally each person would be untenable, particularly for larger groups.

Instead, vision-science researchers have shown that humans' perceptual systems tackle this complexity through a process of ensemble coding, whereby perceivers quickly and accurately summarize statistical properties (e.g., average emotional expression, gender composition) of a group (Whitney & Yamanashi Leib, 2018). This efficient perception of groups aligns with the foundational nature of groups for human social activity; people see groups not with befuddlement but as a seamless part of the daily experience. And yet vision-science research frequently stops immediately after the act of perceiving, focusing more on mechanisms underlying the fidelity of human perception (e.g., attentional resources) and leaving unanswered the question of what comes next. The questions in the previous paragraph are addressed by researchers in diverse fields—from organizational behavior to group dynamics and intergroup relations—who have long examined group processes and outcomes (Hackman & Katz, 2010; Kerr & Park, 2001). Still, just as vision

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scientists stop after the act of perception, small-groups researchers pay little attention to perceptual mechanisms that may influence people's affective, behavioral, and cognitive responses to groups.

In the tradition of social vision (e.g., Adams et al., 2011), we propose that bridging group-perception processes (e.g., the integration of bottom-up visual cues with top-down knowledge) with the downstream consequences of what people do with that group perception opens a rich theoretical space from which novel questions and hypotheses emerge. For instance, perceiving a *group* (compared with a single individual) expands the capacity to perceive group emergent properties, such as diversity, hierarchy, and coordination, as well as group dynamics, such as group cohesion, cooperation, norms, and collective affect. In turn, such emergent properties and dynamics are fundamental to understanding people's response to groups: Are they friendly or hostile? Do I consider them part of my group or not? What behaviors are acceptable? Given the ubiquity of groups, linking how people efficiently perceive groups to the outcomes associated with this perception is vital to understanding human psychology and behavior.

Our primary goal is to expand both the understanding and scope of people-perception research, or the study of how perceptions of groups (via ensemble coding) underlie and support group behavior. We advance three main points. First, people perception provides a framework for integrating a diverse set of research findings from vision science, social cognition, intergroup relations, and organizational behavior. Because groups are foundational to human behavior, it is unsurprising that groups appear across multiple areas of psychological research; what is surprising, however, is that only recently have we begun examining how people perceive groups and what such perceptual processes mean for behavior in groups. Second, we argue that people perception is a generative albeit nascent theoretical space at the intersection of perception and the "doing" that comes after. Specifically, we highlight how understanding the perception of group emergent properties and group dynamics offers unique insights into group behavior. Third, as researchers in this space, we outline open lines of inquiry that would benefit from a social-vision approach.

From Person Perception to People Perception

We begin by briefly outlining the historical and conceptual underpinnings of people perception, detailing points of convergence and divergence with previously siloed work in person perception, vision science, and organizational behavior. Overall, these three areas provide critical insights as to how people perceive groups, yet only in their combination is the full extent of people perception revealed.

Person perception

Foundational work on person perception establishes the processes and effects of perceiving others, including social categorization (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990), emotion recognition (Ekman & Friesen, 1971), and trait judgments (Todorov et al., 2015). Such phenomena are increasingly examined using the lens of social vision, which articulates how bottom-up visual cues (e.g., a person's facial features, skin tone) and top-down cognitive structures (e.g., stereotypes, prior knowledge, motives) integrate to dynamically and probabilistically determine humans' perception of others (Freeman & Ambady, 2011; Freeman et al., 2020; Johnson et al., 2015; Kawakami et al., 2017). This social-vision approach offers the unique ability to connect perceptual processing to behavior through mediating cognitive and motivational processes.

Yet, as its name implies, person perception has largely focused on perceptions of the solitary person, ignoring the processes and downstream implications associated with perceiving groups of people. We contend that people perception likely reflects social-vision tenets. For instance, perceptions of groups are likely the product of bottom-up visual percepts and top-down factors, and the act of perceiving people is in service of doing or responding to social environments (Gibson, 1979/2015; Zebrowitz, 2006). A central premise of people perception, however, is that it extends beyond additive person perception, requiring an articulation of different mechanisms and capacities that in turn engender the perception of unique properties and dynamics. For instance, the act of perceiving people is not simply the case of applying person-perception processes to each individual within a group because groups are perceived at speeds untenable to serial or sequential processing (Haberman & Whitney, 2007; see also Ariely, 2001). Thus, to fully understand people perception requires novel principles and theories.

Our theorizing about people perception also evokes prior work on entitativity (i.e., what makes a group an entity or exhibit a sense of oneness compared with simply being a collection of individuals; Hamilton, 2007; Yzerbyt et al., 2004). Building on Campbell's (1958) framework, researchers have outlined a number of properties that inform a group's perceived entitativity, including group importance, similarity, and common purpose, which subsequently inform judgments about the group (Brewer et al., 2004; Dang & Liu, 2020;

Hamilton et al., 1998, 2002; Lickel et al., 2000). Although some work has examined how perceptual cues inform such judgments (Dasgupta et al., 1999; Fessler & Holbrook, 2016; Ip et al., 2006), this work has largely focused on symbolic and linguistic cues (e.g., written descriptions of groups) to understand the implications of cognitively construing groups as entities.

In contrast to this cognitive focus, we emphasize sensory perception and the social inferences derived from percepts. Specifically, we shift the focus to the in-the-moment act of perceiving people. For example, if a woman sees a line composed of men waiting for a movie or a C-suite team of men working on a deal, her effortless perception and social categorization of the group—a group of men—likely affects evaluations of the group beyond entitativity alone (Alt et al., 2019). Entitativity certainly plays a vital role in understanding group perception; however, here we highlight how perceptual processes extend beyond this single group property.

Vision science

In a separate research tradition, vision scientists have examined humans' perceptual attunement to groups and group-level properties. This phenomenon, termed *ensemble coding*, establishes that the visual system extracts summary statistical properties from sets of objects (Whitney & Yamanashi Leib, 2018). Indeed, early work in psychophysics demonstrated that perceivers could accurately perceive a number of low-level group features, including speed (Watamaniuk & Duchon, 1992) and motion (D. W. Williams & Sekuler, 1984). Later, Ariely (2001) revealed that perceivers were surprisingly accurate in reporting mean size after viewing a set of differently sized circles, although perceivers were inaccurate in identifying whether or not a given individual circle was present in the set. Since then, vision scientists have demonstrated ensemble perception for a host of group properties, including spatial orientation (Dakin & Watt, 1997), spatial location (Alvarez & Oliva, 2008), and number (Halberda et al., 2006). In addition, research has indicated that ensemble perception is accurate for shortened visual-presentation time (as low as 50 ms) and for different statistical distributions (e.g., uniform, bimodal, normal, homogeneous; Chong & Treisman, 2003).

Vision scientists have expanded their examination beyond low-level stimuli to test whether ensemble perception emerges for higher-level stimuli that are inherently social in nature, including emotions, social categories, and identity. In an early demonstration, Haberman and Whitney (2007) showed participants groups of faces (four or 16) for 2,000 ms, after which participants saw a single test face. In a baseline experiment, the faces in the group had identical emotional expressions (e.g., happy–sad), and participants were asked whether the single test face was happier or sadder than the previously seen group. Participants were accurate when test faces were different from the group by at least four units of emotional intensity, reflecting high acuity. In another experiment, participants viewed groups of faces that varied in emotional expression and were asked whether the single test face was happier or sadder than the average emotional expression seen in the group before. Remarkably, participants demonstrated the same degree of sensitivity as the baseline experiment. Yet another experiment showed participants had no memory for individual faces within the group, performing at chance when asked which of two faces were presented in the prior group.

These surprising findings spurred a flurry of subsequent research (see Table 1) that found similar ensemble-coding accuracy for other socially relevant stimuli, including point-light walkers' heading direction (Sweeny, Haroz, & Whitney, 2013), eye gaze (Sweeny & Whitney, 2014), race (Thornton et al., 2014; X. Yang & Dunham, 2019), humanness (Yamanashi Leib et al., 2016), voices in a crowd (Neuhoff, 2017; Neuhoff & Sikich, 2018), head rotation (Florey et al., 2016), and facial identity (de Fockert & Wolfenstein, 2009; Neumann et al., 2013, 2017). This ability to visually extract summary statistics of groups even extends to metrics such as variance; perceivers accurately report whether a four-person group had more or less variability in terms of emotion, gender, race, and facial dominance compared with another four-person group, again using short exposure times (Haberman, Lee, & Whitney, 2015; Phillips et al., 2018).

This work has also revealed several intriguing boundary conditions and proposed mechanisms associated with ensemble perception, such as perceivers' ability to discount extreme deviants in their averaging (Haberman & Whitney, 2010), the possibility of separate mechanisms for ensemble perception of low- and high-level stimuli (Haberman, Brady, & Alvarez, 2015), and the existence of ensemble perception regardless of conscious awareness and visual attention (Fischer & Whitney, 2011; Haberman & Whitney, 2007; Wolfe et al., 2015). Together, these findings highlight the efficiency and ease with which people see groups (for a review, see Whitney & Yamanashi Leib, 2018).

Yet this important work rests largely within the domain of vision science, leaving unexamined questions regarding the downstream impacts of easily and efficiently perceiving the social properties of groups. As demonstrated by social-vision researchers regarding the perception of individuals, top-down information and motives might also affect the perception of groups and ensemble-coding processes. Here, we aim to integrate and build on this vision-science foundation to

Table 1. Examples of Socially Relevant Ensemble Perception

Category and stimuli	Research tradition	Research finding	References
Gender			
Faces	Vision science	Participants performed ensemble coding of gender typicality	Haberman and Whitney (2007)
Faces	Social vision	Participants accurately estimated the number of men, which tracked increased threat ratings	Alt et al. (2019)
Faces	Social vision	Participants accurately estimated the number of men/women, which tracked feelings of fit and belonging	Goodale et al. (2018)
Faces	Social vision	Participants accurately reported the number of men/women, even under different viewing conditions (e.g., inversion)	X. Yang and Dunham (2019)
Faces	Social vision	Participants accurately reported gender variance in groups	Phillips et al. (2018)
Voices	Social vision	Participants accurately reported groups' mean gender typicality from voices	Neuhoff (2017); Neuhoff and Sikich (2018)
Race			
Faces	Vision science	Participants accurately reported groups' mean racial typicality (White and Asian)	Thornton et al. (2014)
Faces	Social vision	Participants accurately estimated the number of Black and White faces, even under different view conditions (e.g., inversion)	X. Yang and Dunham (2019)
Faces	Social vision	Participants accurately reported racial variance in groups (White and Black)	Phillips et al. (2018)
Emotion			
Faces	Vision science	Participants accurately reported groups' mean emotion (happy–sad, neutral–disgust)	Haberman and Whitney (2007, 2009)
Faces	Vision science	Participants accurately reported groups' variance in emotion (happy, sad, angry)	Haberman, Lee, and Whitney (2015)
Faces	Vision science	Participants discounted emotional outliers when estimating mean emotion	Haberman and Whitney (2010)
Faces	Vision science	Participants performed ensemble coding for Monney face crowds, demonstrating holistic processing	Han et al. (2021)
Faces	Vision science	Demonstrated facial expression aftereffects from rapid serial visual presentation comparable to ensemble average	Ying and Xu (2017)
Faces	Vision science	Participants showed sensitivity to average emotion displayed in emotionally dynamic groups	Elias et al. (2017)
Faces	Vision science	Participants showed sensitivity to average emotion, even when their foveal region was occluded	Wolfe et al. (2015)
Faces	Social vision	Participants used group emotion to inform group identification	Goldenberg et al. (2020)
Faces	Social vision	Groups enhanced average group-emotion estimates	Goldenberg et al. (2021); Mihalache et al. (2021)
Faces	Social vision	Participants demonstrated ensemble coding of emotion for mixed-race (Black–White) groups	Lamer et al. (2018)
Motion			
Heading direction	Vision science	Participants accurately reported groups' mean heading direction	Sweeny, Haroz, and Whitney (2013)
Eye gaze	Vision science	Participants accurately reported groups' mean eye gaze	Sweeny and Whitney (2014)
Head rotation	Vision science	Participants accurately reported groups' mean head-rotation direction	Florey et al. (2016)

(continued)

Table 1. *(continued)*

Category and stimuli	Research tradition	Research finding	References
Traits			
Attractiveness	Vision science	Participants accurately reported groups' mean attractiveness level	Luo and Zhou (2018)
Attractiveness	Vision science	Examined ensemble perception in relation to attractiveness, adaptation, and the "friend effect"	Ying et al. (2019)
Attractiveness	Vision science	Examined accounts of ensemble-coding mechanisms for the friend effect	Carragher et al. (2020)
Dominance and hierarchy	Vision science	Participants accurately reported variance in group dominance and hierarchy	Phillips et al. (2018)
Identity			
Faces	Vision science	Participants accurately reported groups' mean facial identity	Bai et al. (2015); de Fockert and Wolfenstein (2009); Neumann et al. (2013, 2018)

examine not only how ensemble coding supports and affects people perception but also what is done with this perception afterward.

Organizational behavior

On what might be considered the opposite pole from research considering rods and cones, organizational-behavior scholars focus on group behavior. Indeed, as described by Hackman and Katz (2010), whereas small group and team research was originally a core topic in social psychology, today such small groups are largely studied in organizational behavior and industrial and organizational psychology instead. Nevertheless, and quite independently from visual traditions, organizational-behavior scholars have recently explored how visual processes affect team functioning. With different aims and theoretical traditions, these scholars have developed different techniques for studying perception, including using naturally existing teams and exercises, and have focused especially on downstream outcomes such as team performance and experience.

First, perhaps the largest body of people-perception work in organizational behavior relates to collective affect: How do small groups of individuals understand and come to share (or not share) emotional experience (Barsade, 2002; Barsade & Gibson, 1997, 2012; Barsade & Knight, 2015; Sanchez-Burks & Huy, 2009; van Kleef & Fischer, 2016)? Given that collective affect is important for team performance (Homan et al., 2016), group members and leaders need to accurately assess collective affect. Sanchez-Burks and colleagues developed a measure of emotional aperture—or individual skill at identifying collective affect—that relies on videos of small groups' emotional expressions as stimuli (Sanchez-Burks et al., 2016). Related work has found that perceivers assess team cohesion from emotional-expression similarity, even more so than race and gender similarity (Magee & Tiedens, 2006).

Second, a smaller body of work builds on thin-slicing traditions, in which perceivers extract insights regarding the performance of individuals (e.g., teachers, marriage partners) from very small amounts of nonverbal information (Ambady et al., 2000). More recent work considers thin slices of entire teams. For instance, perceivers are better than chance at predicting team performance from mere 10-s video clips across work groups, Ultimate frisbee teams, and even rock bands (Satterstrom et al., 2019; Stillman et al., 2014; see also Sullivan & Reno, 1999). Perceptions of team cohesion and collective trust have been identified as critical indicators for such judgments. Likewise, perceivers can detect network and status dynamics from short video clips of working teams, and this has implications for predicted performance (Yu & Kilduff, 2020).

Third, an emerging body of work considers how individual perceivers assess team structures, such as overall diversity and hierarchy. Such perceptions of diversity are traditionally more akin to "judgments" à la group-cognition work rather than truly visual perceptions (e.g., Ely & Thomas, 2001; Shemla et al., 2016). Nevertheless, this work has found that such judgments of diversity and hierarchy are important for team selection, satisfaction, and conflict (Daniels et al., 2017; Homan et al., 2010). Scholars have also considered the visual perception of diversity and hierarchy (e.g., Phillips et al., 2018), which we review in more detail below.

Altogether, work in organizational behavior has highlighted the importance of perceptual processes in small groups and teams and has made headway in studying

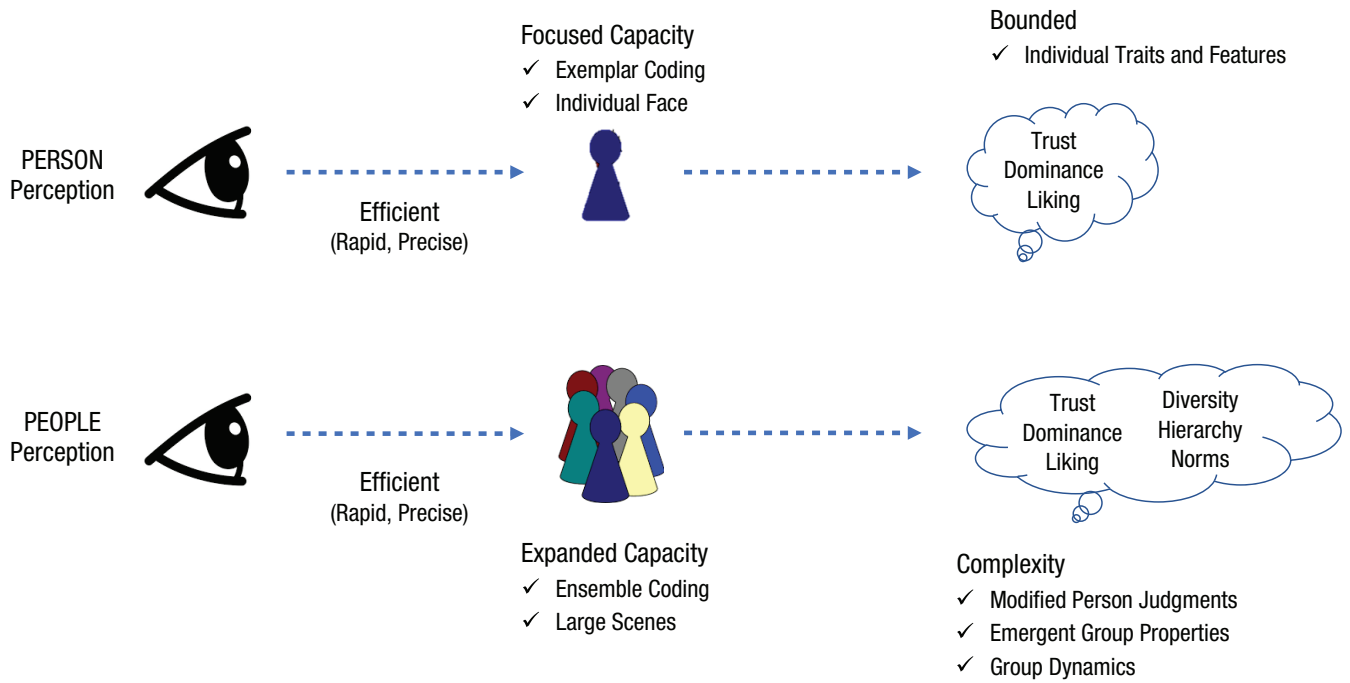

Fig. 1. Principles of people perception versus person perception.

how such perceptions may affect team dynamics. However, the field focuses in particular on team outcomes (e.g., performance, conflict), leaving open questions of visuocognitive mechanisms and mediating processes.

Core Principles of People Perception

The literature reviewed above points to the intersection of vision science, social vision, and organizational behavior as fruitful for developing a foundation of people perception. Advancing this aim, we extract three key principles for people-perception research: efficiency, capacity, and complexity. These principles denote points of convergence with person perception while also demonstrating novel implications of shifting to people perception (see Fig. 1).

First, we theorize people perception to be an efficient and effortless process, which aligns with existing work on person perception (Bodenhausen & Macrae, 1998; Fiske & Neuberg, 1990; Freeman & Ambady, 2011). Other people are incredibly important to human psychological functioning and survival. Thus, whether a single individual or a group, other people should command cognitive-processing resources. In the case of groups of people, ensemble coding has been identified as a core perceptual mechanism enabling efficient processing (Sweeny & Whitney, 2014). For example, even faces outside of awareness can affect ensemble percepts (Fischer & Whitney, 2011; Haberman & Whitney, 2007, 2011; Wolfe et al., 2015). Nevertheless, as in person perception, both bottom-up and top-down processes are likely involved. For instance, people perception is theorized to involve multiple stages of processing, some of which may be more or less deliberative: Extracting summary statistics via ensemble coding should be less deliberative, but then applying that information to guide beliefs and behavior should be more deliberative (see the selection, extraction, and application model; Phillips et al., 2014). Although debate continues regarding ensemble coding and automaticity (see Alvarez & Oliva, 2008; Whitney & Yamanashi Leib, 2018), ensemble coding itself—and thus the people perception it supports—is a rapid, efficient perceptual mechanism.

Second, we theorize that people perception necessarily recruits expanded capacity compared with person perception. That is, groups inherently involve more than a single face. Handling the increased size of a group compared with a single person should involve either more processing capacity or different mechanisms from person perception to be processed efficiently. Ensemble coding solves this capacity-efficiency trade-off by extracting *summary* statistic representations. For example, ensemble-coding mechanisms have been shown to achieve precise group representations in part by overcoming the noise involved in processing individual

members of the group (Alvarez, 2011; ZeeAbrahamsen & Haberman, 2018). Vision scientists have also identified independent ensemble-coding mechanisms for higher- versus lower-level features (Haberman, Brady, & Alvarez, 2015), as well as the ability to simultaneously extract ensembles across different domains (McDonagh & Haberman, 2018; J. Sun & Gauthier, 2021).

Although ensemble coding is an efficient mechanism for dealing with the increased capacity required by groups, processing tasks beyond simply extracting summary statistics are likely still required. For instance, individual persons must be selected as either members of the group to be summarized or not (e.g., Brady & Alvarez, 2011; Haberman & Whitney, 2010; Phillips et al., 2014). This challenge of selection aligns with social-vision tenets in that it is likely affected by both bottom-up visual cues (e.g., visual cues to team membership such as shirt color) and top-down influences (e.g., a priori knowledge that a group contains members of both teams). Altogether, however, research suggests that ensemble coding enables the processing of numerous stimuli and features of such stimuli at once, offering a tool for handling increased capacity beyond a single face (Chong & Treisman, 2005a, 2005b; Corbett & Melcher, 2014; Haberman & Whitney, 2007; but see Neumann et al., 2017).

Third—and the focus of the remainder of our review—we theorize that people perception requires observers to process emergent complexity (e.g., Chan, 1998; Kozlowski & Klein, 2000; Marks et al., 2001). For instance, groups may modify traditional person-perception outcomes such as social categorization or trait judgments, changing judgments by virtue of the group's context, and increased complexity. Further, complex properties, such as diversity or hierarchy, are not possible in single faces but rather emerge only in groups. Finally, from groups emerge unique social dynamics, including shifting group membership, normative behavior, and contagion (de Fockert & Marchant, 2008; Haberman et al., 2009). Thus, processes truly supporting people perception should support the perception of such unique complexity.

We suggest that these three principles together structure people perception. By using these three core principles, researchers can understand how the efficient perceptual mechanisms that enable people perception ultimately affect human affect, behavior, and cognition. Although the visual beginning and behavioral end of this spectrum have each been studied by scholars in isolation, either in the vision sciences or in organizational behavior, social psychologists and those in social vision may be uniquely positioned to bridge this divide, thus linking the perception of groups to group behavior.

Advancing Research in People Perception

As articulated above, perceiving groups is efficient yet requires increased capacity and represents a significantly more complex task compared with perceiving individuals. Although existing reviews have considered the first two principles, efficiency and capacity (e.g., Phillips et al., 2014; Whitney & Yamanashi Leib, 2018), here we focus on unpacking the third principle: complexity. In particular, we highlight three forms of complexity in people perception: modification and amplification of trait judgments, group emergent properties, and group dynamics. Overall, in this section, we aim to review emerging work on complexity and point to critical, important questions for future work.

Groups modify humans' perception of individuals and groups

Groups, by their nature, provide greater sources of information than individuals, which, in turn, affects humans' social judgments. Emerging evidence suggests that groups affect judgments in roughly three ways: groups amplifying trait judgments compared with individuals, groups modifying judgments of individuals within the group, and groups amplifying judgments of the group itself. Across these three domains, these modifications emerge for a variety of reasons, including group characteristics (e.g., numeric size) and features of ensemble-coding processing (e.g., averaging). Here, we unite these diverse findings under the umbrella of people perception.

The first set of findings demonstrates that group characteristics amplify humans' judgments of the group, especially compared with judgments of an individual (or even a smaller group). An illustrative example of this is group numeric size amplifying judgments of threat. Across numerous nonhuman species, including lions, hyenas, and great apes, numeric group size, as assessed via auditory cues (e.g., hearing different roars) or visual cues (e.g., number of other conspecifics), denotes that a particular group is either safe to engage or should be avoided (Boydston et al., 2001; McComb et al., 1994). These findings extend to preverbal infants, who use the numeric size of a group to determine which group will dominate another group (Pun et al., 2016), suggesting that people associate numeric size with dominance early in development. Other group-based cues indicative of group cohesion and coalition (e.g., synchronized movement and similar clothing) also increase the perceived formidability of a single opponent (Fessler & Holbrook, 2016; Fessler et al., 2016) and modify judgments of others' formidability. In addition, individuals who move in sync with another coalitional

member diminish their ratings of an opponent's perceived muscularity (Fessler & Holbrook, 2014). In sum, groups enhance perceived threat and dominance through perceived group properties (e.g., number and cohesiveness), affecting both judgments of the group itself and judgments of other individuals.

Groups, compared with individuals, also amplify stereotyping and prejudice; group stimuli lead to greater explicit endorsement of negative and positive stereotypes and automatic prejudicial associations (Cooley & Payne, 2017, 2019; although see Persson et al., 2021). These findings fit with evidence that humans efficiently learn group stereotypes (Hamilton et al., 2015) and models of person perception, whereby a group as a whole is seen as more representative of a social category than an individual, thus providing greater prototypical fit (Brewer, 1988; Fiske & Neuberg, 1990). Stereotype-amplification processes likely account, in part, for disparities in downstream outcomes. For instance, in U.S. contexts, Black men in groups are more likely than solitary Black individuals to be stopped, arrested, and have force used against them by police, and this difference is also greater compared with White men (Cooley et al., 2020). Thus, although groups as a whole are often deemed more threatening than individuals, these effects operate intersectionally with race stereotypes.

In a second set of modifying processes, groups provide contextual information that affects perceivers' judgments of individuals within the group. For instance, evidence suggests that monoracial groups affect racial categorization and prototypicality judgments of biracial individuals within the group. Specifically, when White perceivers saw biracial faces in groups of Black (but not White) men, participants exhibited categorization patterns indicative of greater hypodescent (i.e., categorizing the face as the racial out-group) and viewed the individual as more stereotypically Black (Cooley et al., 2018). This pattern of modifying judgments of individuals in groups is also reflected in the "cheerleader" or "friend" effect, wherein individuals are rated more attractive when they are in a group than when they are alone (Carragher et al., 2018, 2020; Walker & Vul, 2014). Although conceptually distinct both hypodescent and attractiveness operate via processes consistent with ensemble perception. Whether through a process of assimilation (Walker & Vul, 2014; see also Brady & Alvarez, 2011; Griffiths et al., 2018), saliency (e.g., feature size or temporal frequency; Kanaya et al., 2018), or contrast (Carragher et al., 2020; Ying et al., 2019), judgments about the single face are affected by the surrounding faces, likely driven, in part, by the averaging process evoked by ensemble coding.

Third, evidence suggests that groups, by themselves, amplify judgments beyond what would be predicted by taking the average of each member. Attractiveness judgments demonstrate this property (Verosky et al., 2021). For example, in a study by van Osch et al. (2015), participants rated groups as a whole more attractive than the mean attractiveness rating derived from each individual person's attractiveness. In addition, recent work suggests that when assessing a group's mean emotion, perceivers are systematically biased to rate the average emotional expression (happy-sad) as more intense than the mean formed from the emotional intensity of each face that constitutes that group (Goldenberg et al., 2021). There is also a robust bias that groups amplify the perceived emotion of anger (Mihalache et al., 2021). Overall, this work suggests that groups amplify ratings above the mathematical mean derived from each of its constituent parts, aligning with Gestalt principles that the group is more than its sum (Wertheimer, 1938).

As reflected above, human perception of groups broadly affects social judgments and in turn responses. Highlighting the complexity of people perception, we identify three forms of modification: Perceiving groups leads to amplified evaluations compared with perceiving individuals, compared with perceiving individuals within the group, and even compared with objective properties of the group itself. Together, this work highlights the diversity of these effects and the disparate domains in which they arise. We hope that by collecting these findings under an umbrella of people perception, we can better see the connections and similarities, thus providing a more coherent framework for how group perception affects social judgments.

Groups present emergent properties

Many important social-psychological constructs emerge from groups rather than individuals. For example, an individual cannot have hierarchy or diversity because these are properties of groups alone. Such group emergent properties have been foundational to psychological science, including critical research on hierarchy, experiences of diversity, development of group cohesion, and more (Gruenfeld & Tiedens, 2010). Although research in industrial and organizational psychology and organizational behavior has been particularly focused on emergent properties, states, and processes in teams, linking these to critical outcomes, including conflict and performance (Chan, 1998; Marks et al., 2001), it has often ignored the perceptual antecedents of how people come to perceive these properties. Thus, more work needs to be done to understand the *perception* of such properties and then to connect this perception to subsequent cognition and behavior.

New forays into people perception suggest that humans can indeed perceive group emergent properties

and do so both rapidly and accurately. Many of these psychologically important properties are based on group variance and therefore may require different perceptual processing from summing or averaging, as may be the case when groups modify person-perception judgments. We review this work below and propose future directions and areas of study.

Emerging work on people perception has considered the diversity of groups in particular; what is the variation in faces, motion, or other cues across the group of individuals? Using ensemble-coding methodology, this work finds that diversity is perceived rapidly and accurately. For instance, people can readily track variance in the race and gender of faces (Phillips et al., 2018). Further, in line with earlier work on the involuntary extraction of race and gender cues in person perception (Ito & Urland, 2003), findings suggest that group racial and gender diversity are also visually (from faces, see X. Yang & Dunham, 2019) and auditorily (from voices, see Neuhoff, 2017) extracted. Together, these findings highlight that perceivers are sensitive not only to the mean representation of social categories within groups but also to the variance of social categories within groups.

In addition to being a signal of social-identity diversity, variance is also a signal of hierarchy, or how people rank compared with one another. Perceivers can detect group hierarchy rapidly and accurately, from static face displays or from dynamic dyadic interactions (Hall et al., 2005; Phillips et al., 2018; Tiedens & Fragale, 2003). Individuals can also accurately perceive status hierarchy from groups they are members of (Yu & Kilduff, 2020). Thus, people-perception processes may offer a way for understanding how individuals surmise and track emergent group structures, such as networks.

Variance in movement is also critical for perceiving group cohesion, or the degree of coordination in a group. For instance, perceivers efficiently track collective eye gaze, integrating information about both head and eye direction to infer crowd attention (Z. Sun et al., 2020; Sweeny & Whitney, 2014). Perceivers as young as 4 years old also rapidly and accurately track collective movement, including direction and speed, offering a mechanism for seamlessly predicting and navigating movement in a crowd (Sweeny, Haroz, & Whitney, 2013; Sweeny, Wurnitsch, et al., 2013). Perceivers also attend to facial similarity or emotional similarity to infer cohesion in dyads (Haberman, Lee, & Whitney, 2015; Magee & Tiedens, 2006). The visual extraction of such cues has the potential to help individuals assess coordination at the group level.

Nevertheless, there are some caveats to accuracy. First, in addition to variance, individuals may be influenced by the group mean (Haberman, Lee, & Whitney, 2015; Jeong & Chong, 2020). Second, as in person perception, top-down factors such as beliefs can also affect the perception of group properties. For example, perceptions of both diversity and hierarchy shift depending on people's motivations to maintain the status quo or by their individual conceptualizations of the target construct (Danbold & Unzueta, 2020; Kteily et al., 2017; Phillips et al., 2018). Assessing the gender composition of a group as majority women (vs. majority men) may increase the likelihood that the group is perceived as "diverse," even if the variance is in fact equal. For instance, perceptions of one category (racial diversity) have been found to spill over to beliefs about other dimensions (gender diversity; Daniels et al., 2017). And when certain groups are believed to be irrelevant, they may be neglected entirely via attentional mechanisms (Chen & Zhou, 2018; see also Neel & Lassetter, 2019). Thus, accuracy in perceiving group emergent properties is not always clear-cut and is ripe for future study.

Although existing work has considered diversity in particular, numerous emergent properties have yet to be explored, including those that may not have a single visual cue (e.g., Waller et al., 2016). Conflict is a prime example: Can individuals perceive a group in conflict, and if so, what are the bases of this perception (e.g., a combination of summary representations of mean emotion, emotional variance, and cues to cohesion)? Likewise, interdependence—the extent to which group members rely on one another—is a critically important group emergent property in psychological and organizational theory (e.g., Kelley & Thibaut, 1978). Perceiving such interdependence may rely again on multiple cues across multiple modalities. More work is needed to identify which group emergent properties are indeed perceived via ensemble-coding mechanisms, on the basis of what cues, and how accurately (or not).

Whereas ample theories imply sensitivity to group emergent properties (e.g., self-categorization and social-identity theories, social-dominance theory, evolutionary theories, theories of self-regard; Brandner et al., 2020; Leary & Baumeister, 2000; Mahadevan et al., 2019; Neuberg et al., 2010; Sidanius & Pratto, 1999; Tajfel & Turner, 1979; Turner, 1985) and the importance of this sensitivity for behavior, the mediating role of actually perceiving such properties is only now being tested. For example, past work has found that representation in classrooms and in organizations affects individuals' sense of belonging and ultimately their success (e.g., Cheryan et al., 2009; Mannix & Neale, 2005; Murphy et al., 2007; K. Y. Williams & O'Reilly, 1998). People-perception research is beginning to illuminate how individuals assess this representation in the first place: the rapidly, visually perceived, gender diversity

of a group and critically the mediational role these perceptual judgments have for downstream experiences of belonging. Goodale and colleagues (2018) had observers make judgments about their degree of fit and belonging after viewing groups composed of men and women for only 500 ms. They found that as the number of men in a group increased, women reported a lower sense of fit and belonging in that group; conversely men reported (albeit to a weaker degree) lower fit and belonging in groups composed mostly of women. The perceived number of men and women mediated participants' sense of belonging (Goodale et al., 2018). These findings align with other work showcasing that viewing groups dominated by men can negatively affect women's desire to participate in STEM-related fields and increase physiological signs of vigilance (Murphy et al., 2007). By bridging humans' visual perception of groups and the consequences of that perception, we highlight a unique and fruitful exchange between vision science and social psychology.

Groups present complex dynamics

Like group emergent properties, critical dynamics also emerge in groups: specifically, patterns of group behavior and action. For example, patterns of group behaviors and habits form over time, providing the basis for descriptive norms and influencing prescriptive norms (Miller & Prentice, 2016). Likewise, group boundaries can change over time, indicating who is in or out, as well as shades between (e.g., deviants and exemplars; Macrae et al., 1999). Norms and membership reflect two of the most important topics for groups scholars, and many established theoretical traditions rely on the assumption that norms and membership are readily and accurately perceived (e.g., Ridgeway, 1991; Stephan et al., 2009; Tajfel & Turner, 1979). However, very little work has considered how such perceptions of group dynamics unfold. Perhaps most promising for social psychologists and organizational-behavior scholars is that such exploration of perceptual processes as mediators of group dynamics offers particularly important insights. Here, we review nascent work addressing this core facet of people perception.

How do humans identify groups as in-group versus out-group?

A principal feature of perceiving groups is the identification of coalitions, that is, being able to quickly determine whether a group is part of one's in-group or out-group. At the person-perception level, an abundance of work examines how visual characteristics specific to an individual operate to cue coalitional membership (Boyer et al., 2015; Kurzban et al., 2001; Xiao et al., 2016) and subsequently activate group processes (Brewer, 1979; Fiske & Neuberg, 1990; Hamilton, 2007; Macrae & Bodenhausen, 2000; Sherif & Sherif, 1953; Tajfel et al., 1971). Evidence from people perception extends these findings to understand how visual characteristics of the group signal allegiances. Indeed, perceivable group emergent properties such as behavioral coordination (Sweeny, Haroz, & Whitney, 2013), collective eye gaze (Sweeny & Whitney, 2014), and collective affect (Haberman & Whitney, 2007) likely serve as a scaffold for determining group coalition (Lamer et al., 2018; Phillips et al., 2014). Here we review findings that highlight how perceiving these properties affect group relational dynamics and cue whether a group is formed of in-group or out-group members.

Goldenberg and colleagues (2020) demonstrated that participants are more likely to categorize a group as their in-group when there is alignment between the average emotional expression of the group and one's own emotional reaction to evocative stimuli. Reflecting the importance of group dynamics, this in-group categorization bias was also surprisingly demonstrated when groups had low variance in emotional expression, although the overall mean of the group was different from how participants felt about the images, suggesting a tendency to identify with groups that show lower compared with higher variance in emotional expression. This finding may suggest that fluency operates as a key moderator between ensemble-coding extraction and subsequent perceiver outcomes (Alter & Oppenheimer, 2009). Lamer et al. (2018) also showed that group emotion and race diverge in naturally occurring groups (i.e., photos of people from U.S. colleges) such that for groups composed of Black and White individuals there was greater difference on average emotion between racial groups than within racial groups. In both cases, the perception of a group emergent property (average emotion) signals or covaries with group membership.

There is also evidence that a group's collective eye gaze, for which perceivers are sensitive to the group mean (Sweeny & Whitney, 2014), serves as a cue to group trustworthiness. In a gaze-cueing paradigm, participants saw a group whose eye gaze either correctly or incorrectly signaled a subsequently presented object. Groups for which eye gaze matched where the object appeared were later selected as more trustworthy than groups whose eye gaze did not cue object location (Z. Sun et al., 2020). Here again, perceiving a group emergent property, a group's eye gaze, affected a social evaluation that is critical to group dynamics: trustworthiness.

An important future direction is to further understand how the perception of group emergent properties

integrates and affects group dynamic properties (e.g., group boundaries and group formation). For instance, recent evidence suggests that explicitly thinking about groups, as opposed to individuals, leads decision-makers to consider group emergent phenomena more explicitly, and people making hiring decisions about a multimember team select more women than when hiring for a single position. This increase results partly from individuals' attention to and perception of the group's membership dynamics, including diversity (Chang et al., 2020). In turn, these kinds of perceptions affect the continuing membership of the group.

How do groups behave?

Group norms. To successfully coordinate, individual group members must assess and understand what is typical and expected in the group—that is, individuals must infer group norms (Kahneman & Miller, 1986; Kashima et al., 2013; Kenrick et al., 2003; Miller & Prentice, 2016). Although decades of work point to how important such normative rules are for coordinating behavior, the question of how exactly people infer such norms is also foundational. Past work has considered how parents instruct children in normative rules, how people compare their own behavior to imagined counterfactuals and standards, and how people imagine the beliefs of others—critical to norms that encompass more private behaviors (Kenward et al., 2011; Miller et al., 1990; Prentice & Miller, 1993; Tankard & Paluck, 2016). However, many norms are also perceptually observable (e.g., how loud to speak in the library, how quickly to run in the crowd). And yet little work has considered the perceptual bases of norm inference.

Some studies have highlighted how perceptual processes, relying on ensemble-coding mechanisms, support norm inference in groups of people and, as a result, group coordination. For instance, individuals track crowd behavior—including walking direction, speed, and eye gaze (Sweeny, Haroz, & Whitney, 2013; Sweeny & Whitney, 2014)—and the overall synchrony of such movements. This synchrony information is used to infer group intentions (Wilson & Gos, 2019) as well as trust (Z. Sun et al., 2020) and is critical to group coordination: Individuals must infer not only the existence and actions of the group but also whether or not to join said group in action. Perceptions of intention, cohesion, and trust are thus vital for motivating individuals' behavior within the group, and thus group coordination.

Emerging work suggests observers track even more complicated behavioral norms as well. For instance, scholars have found that people implicitly perceive group norms by accurately tracking visual information about group-member behaviors, such as style of dress and meeting arrival times (Dannals et al., 2020; Dannals & Miller, 2017). This work finds that observers both perceive and discount outliers in generating their summary representation of norms. This dovetails with more visuocognitive work, which finds that observers discount emotionally deviant faces in a group when summarizing group averages (e.g., Haberman & Whitney, 2010) and can achieve ensemble representation even when group members are presented sequentially rather than simultaneously (Hubert-Wallander & Boynton, 2015). Altogether, this suggests that ensemble-coding mechanisms might enable mean and variance summarizing of even complex human behavior in groups.

Group emotion. Shared group emotional experience is also important for coordinating group behavior (Barsade & Gibson, 2012; Goldenberg et al., 2016; van Kleef & Fischer, 2016). Collective emotions support coordination by helping individuals experience shared reality and by binding individual members together into the group itself (Barsade & Gibson, 1997). Understanding the emotions of others relies on perceptual processes, given that emotional responses and expressions are perceived from physical cues in the face, body, and voice (Darwin, 1872; Ekman, 1992; Mayer et al., 1990). However, group emotions can quickly become complex, including not only the average and variance of individual member emotions (collective affect, group affective tone) but also more dynamic experiences, including the spread or contagion of emotions, amplification, and mitigation. Nascent work, reviewed below, has begun to unpack these complex dynamics, finding evidence again that ensemble-coding mechanisms support perception, which in turn can fuel emotional dynamics in groups.

Perceiving such group emotion and changing dynamics is critical for intergroup and crowd behavior in particular, shifting peaceful protests into angry mobs or angry mobs into peaceful protests. Contagion, or the rapid and at least partially automatic spreading of emotional experience from one group member to the next, is theorized as especially important to spurring group behaviors (Hatfield et al., 1994). Emerging work demonstrates the perceptual mechanisms that underlie such behavior change. For example, in a large crowd, overall impressions are shifted toward the most amplified emotions (Goldenberg et al., 2021; Mihalache et al., 2021), which in turn may speed contagion (see also Wróbel & Imbir, 2019).

Recent work also explores leaders' role in managing such emotion dynamics, especially considering individual differences in the ability to perceive group emotion (and, ostensibly, to respond appropriately; Pescosolido, 2002; Sanchez-Burks & Huy, 2009). Indeed,

some people are better than others at perceiving group emotion (Sanchez-Burks et al., 2016; Sanchez-Burks & Huy, 2009), which may be a function of perceiving individual faces (e.g., Mayer et al., 1990) or appropriately summarizing (e.g., discounting outliers; Haberman & Whitney, 2010). In turn, existing theories presume that perceiving group emotion accurately helps spur appropriate management of group emotion—raising the voice, or responding with calm. This link between perception and action may be yet another stage in which individual differences play a role.

Finally, emerging work finds that synchrony is an important element of tracking such group-emotion dynamics. For instance, synchronous emotion changes are easier to track than more variable change (Elias et al., 2017), and synchronous emotions imply both group cohesion (Magee & Tiedens, 2006) and team functioning (Homan et al., 2016). However, some previous work has treated *low variance* as equivalent to *synchronous*, whereas more recent work specifies synchrony as how emotions may *change* at the same time or not. Thus, future work should consider the independent effects of tightly correlated emotions in groups (shared affect) versus tightly correlated changes (synchrony) and the relative inferences each offer to individual members.

Discussion

Work from fields as diverse as vision science and organizational behavior has presented converging evidence that people perception, or the visual summarization of small groups of people, shapes social decision-making and behavior. However, much of this work has remained isolated in two scientific siloes—the vision sciences and organizational behavior—thus missing the chance to investigate and understand key mediating processes that enable quick visual impressions to shape humans' social worlds. Social-vision scholars are uniquely situated to bridge this divide and yet have largely remained focused on person perception instead of turning their attention to people.

Here, we have collected this budding work and extracted three key principles that may help expand the study of person perception to include groups of people: efficiency, capacity, and emergent complexity. With these core principles in mind, we hope new work can begin to tackle the important questions of how people-perception processes extract information about uniquely group-level properties and group dynamics, which in turn shape group behavior.

To the extent that social-vision researchers turn their attention to people perception, working to generate, integrate, and bridge new insights regarding ensemble-coding processes and team-level outcomes, then myriad additional questions are likely to emerge along the way. For instance, we reviewed several important group emergent properties and dynamics above but also mentioned missing properties that deserve study as well. Here, we highlight a few additional questions that stand out thus far related to our principles.

First, regarding efficiency, more work is needed to understand individual differences in the face of effortless processing. For instance, whereas organizational-behavior work has found individual differences in the ability to extract group-emotion information (Sanchez-Burks et al., 2016), ensemble-coding work has found that efficient processing of group emotion happens both outside of humans' awareness and accurately (Haberman & Whitney, 2010; Hansmann-Roth et al., 2021). Thus, it is unclear how such processing contributes to individual differences or whether later-stage processing may be interfering (e.g., Haberman, Brady, & Alvarez, 2015). Likewise, recent work suggests that cultural differences, via training and exposure, may also affect even basic ensemble-coding accuracy (Im et al., 2017; see also Y. Yang et al., 2019). Social-vision scholars, at the intersection of these two ends, may be particularly well suited to help understand when and how individual differences play a role.

Second, by applying a social-vision lens, new insight can be gleaned regarding how top-down processing and midlevel connections (Freeman & Ambady, 2011) interact, support, or interfere with efficient visual processes to ultimately influence behavior. For instance, recent work has begun to document spillover effects, in which ensemble percepts along one dimension influence perceptions of other dimensions. When people reflect on the gender diversity of a group, their impression is shaped not only by gender composition but also by the racial diversity of the group (Daniels et al., 2017; see also Crawford et al., 2019). Likewise, ensemble representations of group emotion can affect impressions of the actual size of the group (Doi & Shinohara, 2016). In addition, as reviewed above, research has also identified spillover effects moving from the group to impressions of the individual—and vice versa—and impressions of group emotion affect impressions of individual emotions (Corbin & Crawford, 2018; Griffiths et al., 2018; see also Chang et al., 2020). Beyond different dimensions, different statistical features (e.g., variance and mean) may also interfere with one another (Maule & Franklin, 2020; Phillips et al., 2018).

Furthermore, although we have focused especially on the visual perception of groups of people, the *representation* of groups of people also deserves attention. Representing groups likely requires the integration of information across multiple cognitive modalities (e.g.,

vision, memory, judgments, knowledge). For example, Yamanashi Leib and colleagues (2020) found that perceivers were sensitive to the average economic value of sets of common objects, demonstrating how these modalities (vision and knowledge of objects' worth) blend to achieve ensemble judgments (see also Putnam-Farr & Morewedge, 2021; Yamanashi Leib et al., 2016). Taking a social-vision lens may help to better understand how humans' perception of groups represents a first step in shaping associated beliefs, cognitions, and intergroup dynamics (e.g., inequality, racism, sexism). Overall, more work is needed to understand how and why multiple dimensions may be processed together and what consequences this has not only for perception but also for social decision-making and behavior.

Third, active debates within the ensemble-coding literature consider to what degree people perception is truly automatic, as well as to what degree such perception relies on truly distinct processing mechanisms compared with those involved in individual person perception (Hansmann-Roth et al., 2021; Neumann et al., 2017; Whitney & Yamanashi Leib, 2018; ZeeAbrahamsen & Haberman, 2018). This question of automaticity has long been an issue within social-vision research and psychological research more broadly (Bargh, 1994). Using methods and insights from across these fields should improve understanding of how perception translates into action. In addition, integrating and testing understanding of top-down factors in relation to critiques of this idea (Firestone & Scholl, 2016; but see also Freeman et al., 2020) is necessary to elucidate the exact mechanisms by which perception is affected by cognitive structures, particularly in the context of groups.

Relatedly, one set of processes may be involved in visually extracting information about groups, which then intersects with processes associated with mentally representing and remembering those groups later. For example, some work has considered how individuals come to understand and represent relational systems and network connections within groups (e.g., social-network schemas) partly on the basis of information they glean automatically and visually (Alt et al., 2021; Brands, 2013; Casciaro et al., 1999; Kilduff & Krackhardt, 1994; Mobasseri et al., 2021; Smith et al., 2020; Yu et al., 2021; Yu & Kilduff, 2020). Such information about specific relationships and the overall group structure likely complements people's knowledge of who belongs in the group or subgroups, entitativity, and fault lines that may exist within the group, all of which is updated dynamically over time. In turn, information about the specific network structure should affect social behavior and influence who people reach out to and who they avoid (e.g., Yu & Shea, 2021).

Conclusion

Groups are a fundamental organizing unit for human behavior. However, social-vision work has overwhelmingly focused attention on person perception rather than expanding to consider people perception. By drawing on scholarship from both the vision sciences and organizational behavior, we identified core principles of people perception. In turn, we leveraged these principles to identify open research questions, including the need for work that clarifies how ensemble perceptual processing affects behavior by mediating cognition and motives. We hope that fellow scholars take up this call to examine people perception.

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