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Perceptions of Groupness During Fitness Classes Positively Predict Recalled Perceptions of Exertion, Enjoyment, and Affective Valence: An Intensive Longitudinal Investigation

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Group contexts such as fitness classes are popular forms of physical activity, and studying them can uncover new ways to promote exercise adherence. Focusing on the potential for group fitness experiences to vary from class to class, we examined how exercisers' dynamic perceptions of groupness relate to recalled perceptions of exercise enjoyment, affective valence, and exertion. These outcome variables are in focus because they are theoretically construed to be determinants of physical activity. Using an intensive sampling methodology across a 2-week period, 97 adult exercisers (M_{age} = 42.35 years) completed surveys following each fitness class attended (695 unique responses). Using multilevel confirmatory factor analysis, we confirmed a theorized two-factor structure of groupness at both the within- and between-person levels. Multilevel modeling revealed that class-to-class fluctuations in exercisers' perceptions of groupness explained a considerable portion of variance in recalled perceptions of exertion, enjoyment, and affective valence. Specifically, during classes in which exercisers' perceptions of groupness were relatively higher, exercisers reported more recalled enjoyment, affective valence, and exertion. Focusing on how variability in groupness perceptions may influence exercise adherence, these findings demonstrate the value in fitness classes feeling like authentic groups. In studying the dynamic aspects of group evaluations, the current study makes novel advancements to group theories applied to exercise settings. Perhaps most notably, individuals' variations in their cognitive evaluations of fitness groups were closely linked to their affective responses to exercise.

Keywords: exercise psychology, entitativity, physical activity, group dynamics, daily diary

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To combat the myriad health concerns associated with physical inactivity (e.g., cardiovascular disease), researchers have dedicated great effort to understanding individual-level factors such as cognitions, attitudes, and motivations. Both researchers and practitioners have struggled to leverage social and environmental factors that promote sustained engagement in physical activity (Stevens et al., 2017). Nevertheless, groups are readily used to influence individuals' behavior and promote physical activity across a wide array of people—ranging from youth to older adults—often in the form of sport teams and group-based physical activity interventions (Beauchamp et al., 2018; Estabrooks, 2008; Eys & Evans, 2018).

In line with seminal work on the fundamental need to belong (Baumeister & Leary, 1995), it is often presumed that physical activity groups can become the source of affiliation, belonging, and identity that subsequently promotes greater investment in physical activity. Indeed, strongly identifying with an exercise group predicts greater participation in physical activity and increased exercise-specific satisfaction (Stevens, Rees, & Polman, 2019). However, a meta-analysis that contrasted various intervention formats for exercise found that these benefits were greater in settings that entailed strategies to foster members' interactions and were described as "true groups," compared with traditional classes (i.e., mere collectives of individuals exercising together) or home-based interventions (Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006). This finding demonstrates the value of exercising in a social setting that resembles an authentic group. Extending this reasoning, although exercise and physical activity often takes place with others, the subjective meaning individuals form about whether the collective is truly a group carries a great deal of influence (Martin, Bruner, Eys, & Spink, 2014). Group settings can *feel* more like an authentic group when they entail: (a) a collective identity, (b) a shared sense of purpose, (c) group structure, and (d) interdependence among members (Kozlowski & Ilgen, 2006). Such feelings reflect a construct termed *groupness*, which is the extent to which members of a collective perceive that they belong to a group and rely on fellow members, as well as the degree that members interact to form a social structure (Evans et al., 2019; McGrath, 1984; Spink, Wilson, & Priebe, 2010).

In initial work on perceptions of groupness in exercise settings, researchers operationalized this construct as an aggregation of five group characteristics: common fate, social structure, mutual benefit, group processes, and self-categorization (Spink et al., 2010). Responding to a five-item instrument that maps onto these characteristics of groups, those who perceived their fitness setting as entailing greater levels of groupness also reported greater frequency of physical activity in the preceding months. Although this early work sparked interest in the role of groupness within physical activity settings (Martin, Balderson, Hawkins, Wilson, & Bruner, 2017), it also had several shortcomings. Notably, the study involved a small sample ($N = 86$), participants were asked to recall an exercise class from up to 6 months prior, and groupness was not assessed in relation to actual groups.

To continue advancing this literature, Evans and colleagues (2019) recently established a theoretical and measurement-based foundation for studying groupness within exercise groups featuring two dimensions: entitativity and group structure. First, entitativity encompasses the beliefs that individuals form about whether or not their setting is a group, as an existing entity with shared similarities and boundedness (Campbell, 1958). In contrast, perceptions of group structure entail the extent that members describe their groups interacting and sharing social structures to guide those interactions—represented by member communication, roles, and shared norms (Spink & Carron, 1993). In this perspective, groupness is represented through abstract cognitions (*does this seem like a group*?), alongside more concrete beliefs about how others behave in ways that constitute a group (*do we act like a group*?).

With the advent of this revised conceptualization of groupness, it is critical to situate this construct alongside existing research on group cohesion. Specifically, group cohesion entails perceiving an exercise group as united when pursuing goals (i.e., group integration) and satisfying the affective needs that individuals hold related to the group (i.e., attraction to the group) both during the task and through social interactions (Estabrooks & Carron, 2000). Whereas groupness represents one's perceptions of how closely a collective represents a "true group," cohesion is an emergent group state that takes

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place further downstream in that cohesion reflects one's perceptions about the group with the assumption that the collective is indeed a "true group." More simply, groupness is a belief about whether members represent a group, regardless of affective feelings toward the group or how well members work together. With regard to theoretical temporality between the two constructs, groupness is considered to be a key antecedent of cohesion such that efforts to strengthen group cohesion often involve promoting entitativity and group structure (Spink & Carron, 1993). As such, interventions commonly leverage components of groupness to build and develop cohesion through means such as setting group goals, forming norms for how members act, and assigning roles for members (Carron, Spink, & Prapavessis, 1997). Although it is anticipated that groupness and cohesion share variability, the two constructs are conceptually distinct with clear justification for distinguishing groupness as a malleable property of groups.

The Dynamic Nature of Groups

Group dynamics researchers have critically asserted that, despite its name, the dynamic nature of groups is rarely studied (Cronin, Weingart, & Todorova, 2011). Indeed, there have been several calls for group researchers to begin investigating how changes in perceptions of groups relate to behavioral outcomes. The dynamic nature of exercise groups has been demonstrated by Dunlop, Falk, and Beauchamp (2013), who found that social cohesion within groups increased progressively across eight class sessions. A related promising approach for exploring the dynamic nature of group perceptions is to intensively sample participants and distinguish between-person associations from within-person associations using a multilevel framework. For example, researchers using this methodology found that exercisers reported more satisfaction—relative to their average level of satisfaction—following group fitness classes in which they felt greater group cohesion (Maher, Gottschall, & Conroy, 2015).

The dynamic nature of exercise groups is particularly evident within group fitness classes. Classes are a popular form of group exercise—spanning clinical and recreational settings—where individuals congregate to engage in various forms of physical activity and are often led by an instructor. Existing studies of group fitness classes have been primarily constrained to cross-sectional comparisons and thus provide limited knowledge pertaining only to between-person effects (Stevens et al., 2019). The value in directly modeling within-person variability in associations between fitness experiences and motivational constructs is evident in the aforementioned examples (Dunlop et al., 2013; Maher et al., 2015). Emerging research is revealing novel ways of modeling these associations over time (e.g., multilevel growth curve modeling; Ntoumanis et al., 2018) and in integrating longitudinal evaluations of fitness instructor interventions (Ntoumanis, Thøgersen-Ntoumani, Quested, & Hancox, 2017). As such, individual perceptions of the social aspects of fitness classes, such as groupness, may be dynamic in that they vary within-person from one class to the next (i.e., "class to class").

Given the value in modeling the dynamic nature of group fitness, there is a clear rationale for additional longitudinal examinations of exercisers' experiences in group fitness classes. Whereas previous research has focused on the dynamic nature of cohesion within intact groups that have consistent membership and instructors (Maher et al., 2015), it is unclear how these perceptions relate to other evaluations of groups and to contexts where individuals attend classes that do not have set group rosters (e.g., drop-in style). Even within drop-in style group classes, perceptions of groupness may be a malleable aspect that could be targeted either in the absence of a true group structure (i.e., establishing entitativity among members who lack critical components of a group, like a consistent set of attendees) or could be a focus when trying to strengthen group structure. Understanding the extent to which people fluctuate in their perceptions of fitness class experiences, and the potential consequences of such fluctuations, may provide valuable insight into how fitness classes can be ideally structured to promote positive experiences and adherence.

Links Between Groupness Perceptions and Recalled Exercise Experiences

Evaluating the salience of groupness perceptions in fitness classes entails (a) outlining a theoretical foundation for understanding how group evaluations relate to broader evaluations of exercise experiences and (b) identifying crit-

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ical social cognitions that may position these evaluations as relevant for exercise motivation. First, existing literature indicates that exercising in groups can play a key role in individuals' exercise experiences that are, in turn, likely to impact behavior over time (Beauchamp et al., 2018; Estabrooks, 2008; Gilbert, Chaubet, Karelis, & Dancause, 2017; Maher et al., 2015). Although numerous frameworks explain social influences, we focus on the social identity approach to explain how higher perceptions of groupness in fitness classes may influence the quality of an exercise experience. The social identity approach is built on the proposition that psychology and behavior are shaped by the groups that individuals internalize as part of their sense of self (Turner, Oakes, Haslam, & McGarty, 1994). Integrating the group into one's self-concept produces a shift in attitudes about the social environment (e.g., increased enjoyment; motivation to engage in the group and its activities) and fosters commitment to prototypical group behaviors (Turner, 1982). Social identity theorists argue that true exercise groups promote more enjoyable and pleasurable physical activity experiences because they satisfy global psychological needs (e.g., belonging and meaning; Greenaway, Cruwys, Haslam, & Jetten, 2016; Stevens et al., 2017). In both sport and exercise settings, having a shared sense of "us" has been found to predict greater attendance and adherence (Stevens et al., 2019). Thus, studies that have tested tenets of a social identity approach provide a basis for the current investigation of group fitness: We generally anticipate that perceiving a higher degree of groupness will correspond to a more enjoyable and pleasurable experience.

Potential associations between evaluations of pleasure (i.e., affective valence) and enjoyment are important in light of theoretical advances in exercise psychology. Exercise-related affect and enjoyment perceptions are situated within numerous theoretical frameworks, including their centrality to intrinsic motivation (i.e., self-determination theory; Ryan & Deci, 2000) and as the affective component of attitudes (i.e., theory of planned behavior; Ajzen, 1991). Theorists particularly emphasize the predictive value of in-task affect using hedonic theoretical perspectives, whereby affective responses during activity condition responses and are predictive of physical activity behavior over time (Ekkekakis & Lind, 2006; Williams, Dunsiger, Jennings, & Marcus, 2012). Whereas in-task affective responses are powerful predictors of behavior and the most valid representation of experiences, recent findings also demonstrate how recalled affective evaluations shape exercise cognitions such as intentions and affective forecasts (Ruby, Dunn, Perrino, Gillis, & Viel, 2011). Similarly, theorists working in the domain of behavioral economics have emphasized that remembered utility (i.e., a retrospective evaluation of an experience) is predictive of whether that behavior will be repeated (Ariely & Carmon, 2000). Applied to the domain of remembered affective responses to exercise, Zenko, Ekkekakis, and Ariely (2016) directed researchers to consider how numerous biases that influence individuals' recollections of past exercise could be used to produce more positive affective forecasts in exercise, claiming that: "From the standpoint of intervention, the question, then, is how the affective memories of and the affective forecasts for exercise can be improved" (p. 150). Specifically, Zenko and colleagues (2016) demonstrated that shifts in the structure of exercise sessions (e.g., hardest part first) produced more favorable recalled evaluations. Considering these research patterns, we expect that classes featuring high groupness will shape experienced affect and, importantly, recollections of previous sessions. Given the extant theoretical support, postexercise recall of exercise enjoyment and affective valence are key constructs to study in terms of proximal targets (i.e., mechanisms) that may increase exercise adherence.

Groupness perceptions may also facilitate deeper engagement in fitness classes, which we expect to be reflected in perceived exertion. Although capturing psychophysical ratings of perceived exertion in the moment is ideal (i.e., Ratings of Perceived Exertion [RPE]; Borg, 1998), postexercise cognitive recall of perceived exertion is a valid indicator of exertion (Singh, Foster, Tod, & McGuigan, 2007). Retrospective reports of perceived exertion capture cognitions regarding the completed exercise bout (i.e., often referred to as session RPE), but are distinct from true psychophysical indices of perceived exertion that are captured during exercise (Foster et al., 2001).

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Current Study

Group perceptions are likely to be dynamic, and modeling this within-person variance through repeated assessments would provide a deeper understanding of how group appraisals relate to other constructs. This is particularly true of drop-in style group fitness classes, whereby the social environment can vary dramatically from one class to the next (e.g., different people in attendance). Using an intensive sampling methodology (i.e., repeated assessments following several group fitness classes), the current study investigated how class-to-class variability in perceived groupness relates to reports of recalled exertion, enjoyment, and affective valence immediately following a group fitness class. This knowledge holds theoretical implications pertaining to how groups impact how exercisers recall exercise experiences, and also holds practical implications for structuring physical activity in ways that people will enjoy and to which they will ultimately adhere. Given the intensive sampling design, a secondary goal of this research was to evaluate the factor validity of a recent measure of perceived groupness (i.e., unique entitativity and group structure subscales; Evans et al., 2019).

First, we anticipated a two-factor structure of groupness at both the within- and between-person levels. Pertaining to the primary focus of this study, with the expectation that rich group experiences are more pleasurable, we hypothesized that perceptions of groupness would be positively related to exercisers' reports of recalled affective valence and enjoyment. Furthermore, with evidence that individuals may exert more effort when they exercise in a true group (Martin, Anderson, Schmale, Hallworth, & Hazell, 2016), we expect that groupness perceptions may carry social motives to report exerting more effort (assessed through postclass recall of exertion). Although entitativity and group structure are conceptually distinct dimensions of groupness, no specific hypotheses were made for differential associations with study constructs. Finally, although the novelty of the research question precluded us from making explicit multilevel hypotheses, the dynamic nature of group environments is expected to be captured by the intensive longitudinal design. As such, we generally anticipated that variance in the outcome variables would be more strongly predicted by groupness at the within-person level than at the between-person level.

Method

Participants and Procedures

All study procedures were approved by the first author's institutional ethics review board. Participants were adult members of a small group fitness facility in the Northeastern United States. Although a total of 181 members completed at least one survey, the multilevel approach required participants to provide responses to three or more time points during the 2-week study period for inclusion in the main analyses. The final sample of 97 members (M_{age} = 42.35; SD = 12.49) completed an average of 7.16 class surveys (SD = 3.30), totaling 695 unique responses. Sample size in multilevel analyses is more heavily dependent on the number of between-person respondents (number of individuals) than the number of within-person responses (number of responses per person). Methodologists have found evidence that when studies entail at least 50 between-person respondents (i.e., 50 participants), multilevel analyses yield accurate estimates and unbiased standard errors (Maas & Hox, 2005). As such, the current between-person sample size of 97 provides an adequate sample size for estimating multilevel effects.

The sample consisted of 85.56% women, was predominantly Caucasian, and had a mean body mass index of 25.27 (SD = 4.97) based on self-report. Data were collected by members of the research team who were stationed at the fitness facility during all hours of operation for a 2-week period. Immediately following each class, as participants left the exercise studio and entered the facility lobby, participants completed a brief paper-and-pencil questionnaire pertaining to characteristics of the class and feelings toward the session that they had just completed. Although this provided a brief span of time for members to cool down and put away equipment, surveys were completed before members changed or left the facility (i.e., within 10 min of completing the class). Demographic information was only asked of participants when they completed their first questionnaire. The average class size was 15.65 members (SD = 3.88) and class offerings included car-

diovascular activities such as cycling and mixed martial arts, synchronized strength training using weights, and high-intensity interval classes. Most classes promoted vigorous intensity activity (i.e., ~80–90% max heart rate). To reduce the impact of intensive sampling (e.g., burden), we simplified the questionnaire by using single-item instruments when possible (Ohly, Sonnentag, Niessen, & Zapf, 2010).

Measures

Groupness. To assess perceptions of groupness during fitness classes, we used a recently developed measure that is conceptually grounded in Kozlowski and Ilgen's (2006) definition of a true group (for full description of scale development, see Evans et al., 2019). Item development for this measure drew upon measures of groupness (Spink et al., 2010), interdependence (Van der Vegt, Emans, & Van de Vliert, 1998), and entitativity (Hogg, Sherman, Dierselhuis, Maitner, & Moffitt, 2007). The six-item instrument is hypothesized to consist of two three-item subscales. The first, Entitativity, captures the degree to which participants perceive members as being an entity (e.g., "This exercise session felt like a team effort"). The second subscale, Group Structure, involves perceptions of members adopting roles and group norms (e.g., "Members of this class took-on roles that impacted other members"). Responses were on a 7-point Likert-type scale (1 = *not at all*, 7 = *very much so*). The full measure, including all six items, is available in the online supplemental materials.

Outcome variables. To assess participants' subjective level of recalled exertion from each exercise classes that they had just completed, we used a modified version of Borg's (1998) RPE Scale. This retrospective exertion item asked "What was the overall amount of exertion you felt in this class, today?" where response options ranged from 6 (*no exertion*) to 20 (*maximal exertion*). Whereas the RPE is designed to assess psychophysical perceptions of exertion during exercise, we used this scale to capture exercisers' cognitive recall of their overall level of exertion during the class. Although this is a critical distinction, cognitive recall of exercise exertion is moderately correlated with physiological indices of exertion (e.g., heart rate) and is a valid indicator of perceived training intensity (Foster et al., 2001). Recalled enjoyment was assessed using a single item that has been used previously in this domain (Maher et al., 2015): "This class was enjoyable," whereby participants responded on a 7-point scale (1 = *not at all*, 7 = *very much so*). Finally, recalled affective valence was assessed using a modified version of the single-item Feeling Scale (Hardy & Rejeski, 1989), which asked "How did you feel throughout the class you just participated in" from −5 (*very bad*) to +5 (*very good*), with several additional anchors in-between (i.e., fairly bad, neutral, and fairly good). Although this single-item measure is commonly used within exercise psychology research (Ekkekakis, Hall, & Petruzzello, 2008), only the affective dimension of valence was measured (not arousal).

Analyses

In an initial step to test the hypothesized two-factor structure of groupness (i.e., entitativity and group structure), we followed Hox, Moerbeek, and van de Schoot's (2017) multilevel confirmatory factor analysis (MCFA) procedures using the "lavaan" package in R (Huang, 2017; Rosseel, 2012). We then calculated multilevel α for each factor (Huang, 2017). These procedures are described in the online supplementary material.

We used linear multilevel modeling to examine how class-to-class variability in recalled exertion, enjoyment, and affective valence link to within-person variance in perceived groupness. This enabled us to disentangle variance at the within-person level from the variance that is due to stable between-person differences. All models were fit using the "nlme" package in R (Pinheiro et al., 2017). We first calculated the amount of within-person variance for each outcome variable by specifying unconditional null models (Raudenbush & Bryk, 2002). In the next step, we specified separate random intercept models for each outcome variable. Five theoretically relevant covariates were specified: Sex (time invariant; coded: 1 = male, 2 = female), age at baseline (time invariant), class size (time variant), whether the class entailed synchronous movements (time variant; coded: 1 = yes, 0 = no), and participants' *n*th response (time variant) to control for temporal ordering of participant responses.

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The two groupness subscales, Entitativity and Group Structure, were entered as fixed effects partitioned into within- and between-person components. Although the primary focus of the current study was on the within-person variance in groupness from class to class, it was necessary to account for the between-person variance in each model (Enders & Tofighi, 2007). Between-person groupness variables were calculated as each participant's mean score across all classes attended, whereas within-person groupness variables were person-mean centered (Enders & Tofighi, 2007). Variance inflation factor was computed for each variable as an index of multicollinearity, whereby scores >5 indicate a concern for multicollinearity (Kutner, Nachtscheim, Neter, & Li, 2004). A final note relates to considering the covariance structure. When data comprise repeated measures over time, it is important to assess associations between errors (e.g., measurements closer in time may be more strongly related) and heteroscedasticity of error variances (i.e., magnitude of error variances may change across time; Bliese & Ployhart, 2002). Likelihood ratio testing indicated that, compared with an unstructured error variance, an autoregressive covariance structure (i.e., errors are correlated across time) demonstrated improved model fit and was therefore specified for each of the linear multilevel models.

Results

The results of the MCFA procedures supported the two-factor model of groupness. At the within-person level, the one-factor model fit (i.e., $\chi^2 = 47.91$, $df = 9$, $p < .001$; Comparitive Fit Index [CFI] = .961; Root Mean Square Error of Approximation [RMSEA] = .085; Standardized Root Mean Square Residual [SRMR] = .038; Akaike Information Criterion [AIC] = 8349.24) was inferior to the two-factor model fit (i.e., $\chi^2 = 9.26$, $df = 8$, $p = .321$; CFI = .999; RMSEA = .016; SRMR = .016; AIC = 8312.59). Similarly, at the between-person level, the one-factor model (i.e., $\chi^2 = 68.37$, $df = 17$, $p < .001$; CFI = .969; RMSEA = .093; SRMR = .019; AIC = 10,758.94) did not fit the data as well as the two-factor model (i.e., $\chi^2 = 33.74$, $df = 16$, $p = .006$; CFI = .989; RMSEA = .057; SRMR = .018; AIC = 10,726.31). Although the MCFA supported the two-factor model of groupness, the interfactor correlations between the two subdimensions were high: $r = .82$ at the within-person level, and $r = .90$ at the between-person level. Although the MCFA supported the two-factor model of groupness, the interfactor correlations between the two dimensions were high at both the within-person ($r = .82$) and between-person levels ($r = .90$). Interfactor correlations are a complex and contentious issue for which no cutoffs have been established, but high values may indicate collinearity between subdimensions (i.e., lack of discriminant validity). To mitigate concerns regarding collinearity, variance inflation factor scores were computed (reported below). Multilevel α indices for entitativity were .96 (between) and .87 (within). The αs for group structure were .87 (between) and .68 (within).

Additional preliminary analyses examined potential violations of assumptions. Several variables were skewed, violating the assumption of normality: entitativity = −1.37; enjoyment = −1.79; recalled affective valence = −2.90. Box-Cox transformations were implemented to normalize the distributions of these variables, which resulted in more acceptable skewness: entitativity = −0.75; enjoyment = −1.29; recalled affective valence = −1.14.

Table 1 displays the descriptive statistics, multilevel correlations, and intraclass correlation coefficients. Correlations were decomposed into the pooled correlation within persons and the weighted correlation of the means between persons (Pedhazur, 1997). Note that correlation coefficients in longitudinal multilevel studies should be interpreted descriptively rather than inferentially, given that important information is factored out of relations in each case (see Conroy et al., 2015). The intraclass correlation coefficient values were derived from the unconditional null models and are listed on the diagonal. Supporting our multilevel approach, there was significant within-person and between-person variability in the groupness subscales, although a larger portion was due to between-person differences. Further, there was a considerable portion of within-person variability in recalled exertion, enjoyment, and affective valence.

Results from the linear multilevel models are displayed in Table 2. Within-person variance (i.e., time-varying) in entitativity ($\gamma_{40} = 0.15$; $p < .001$) and group structure ($\gamma_{50} = 0.07$; $p = .002$) were positively associated with perceived

Table 1
Descriptive Statistics, Bivariate Correlations, and Intraclass Correlation Coefficients

Variable	*M*	*SD*	1	2	3	4	5
1. Entitativity	5.72	1.31	**(.75)**	.59	.36	.28	.17
2. Group structure	5.19	1.37	.85	**(.70)**	.29	.24	.12
3. Recalled exertion	17.38	2.06	.21	.21	**(.31)**	.24	.11
4. Recalled enjoyment	6.50	0.74	.67	.60	.38	**(.31)**	.41
5. Recalled affective valence	4.22	1.10	.54	.48	.37	.77	**(.27)**

Note. Intraclass correlation coefficients (i.e., proportion of between-person variance) are displayed in bold on the diagonal. Between-person level correlation coefficients are shown below the diagonal and within-person correlation coefficients are shown above the diagonal. *M* = sample-level mean, *SD* = sample-level standard deviation. Entitativity, Group Structure, and Enjoyment scales ranged from 1 (*not at all*) to 7 (*very much so*). Recalled Exertion scale ranged from 6 (*no exertion at all*) to 20 (*maximum exertion*). Affective Valence ranged from −5 (*very bad*) to +5 (*very good*).

exertion. In other words, participants recalled exerting themselves more during classes in which they perceived greater groupness. Within-person variance in entitativity ($\gamma_{40} = 0.20$; $p < .001$) and group structure ($\gamma_{50} = 0.10$; $p = .021$) were positively associated with enjoyment. That is, participants recalled more enjoyment from classes in which they perceived relatively more groupness. Finally, participants recalled experiencing higher (i.e., more positive) affective valence during classes in which they perceived greater levels of entitativity ($\gamma_{40} = 0.20$; $p < .001$). At the between-person (i.e., time-invariant) level, entitativity was positively associated with recalled enjoyment ($\gamma_{03} = 0.24$; $p < .001$) and affective valence ($\gamma_{03} = 0.27$; $p < .001$), meaning that exercisers who generally held higher overall perceptions of entitativity—averaged across all classes attended—reported greater recalled enjoyment

Table 2
Linear Multilevel Models Predicting Recalled Exertion, Enjoyment, and Affective Valence in Group Exercise Classes

	Perceived exertion		Enjoyment		Affective valence	
	b (*SE*)	VIF	*b* (*SE*)	VIF	*b* (*SE*)	VIF
Fixed effect						
Intercept (γ_{00})	15.27 (1.04)**		15.16 (1.96)**		2.03 (1.66)	
Age (γ_{01})	0.03 (0.01)*	1.04	0.01 (0.02)	1.04	0.02 (0.02)	1.04
Sex (γ_{02})	0.09 (0.38)	1.04	0.09 (0.70)	1.04	0.67 (0.60)	1.04
Class size (γ_{10})	−0.02 (0.01)	1.26	0.01 (0.02)	1.27	0.03 (0.02)	1.26
Synch (yes = 1, no = 0) (γ_{20})	−0.29 (0.19)	1.22	−0.16 (0.07)	1.23	0.06 (0.31)	1.23
Response number (γ_{30})	0.08 (0.02)**	1.04	−0.02 (0.01)*	1.04	0.00 (0.04)	1.04
WI entitativity (γ_{40})	0.15 (0.02)**	1.54	0.20 (0.05)**	1.56	0.20 (0.04)**	1.54
WI group structure (γ_{50})	0.07 (0.11)*	1.55	0.10 (0.04)*	1.57	0.02 (0.04)	1.55
BW entitativity (γ_{03})	0.05 (0.04)	3.75	0.24 (0.07)**	3.73	0.27 (0.07)**	3.73
BW group structure (γ_{04})	0.00 (0.04)	3.75	0.04 (0.07)	3.74	−0.01 (0.07)	3.74
Random effects						
Intercept (μ_{0j})	1.03 (1.59)		1.81 (3.38)		1.57 (2.67)	
Variance explained						
Conditional R^2/marginal R^2	0.42/0.18		0.40/0.23		0.40/0.20	
Model fit (−2 × log likelihood)						
Null model	2,860.10		3,650.15		3,600.17	
Model with only covariates	2,609.58		3,528.52		3,285.59	
Final model	2,502.08		3,406.97		3,124.92	

Note. All fixed effects are unstandardized regression coefficients. Error variances are heterogeneous (i.e., allowed to vary across classes). VIF = variance inflation factor; Synch = class entailed synchronous movement; WI = within-person level; BW = between-person level.
* $p < .01$. ** $p < .001$.

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and recalled increasingly positive affective valence during fitness classes. Variance inflation factor scores indicated only a minimal amount of multicollinearity among the study variables (see Table 2).

Discussion

We investigated how variability in perceptions of groupness in fitness classes across time relate to exercisers' ratings of recalled exertion, enjoyment, and affective valence. Whereas studies have investigated dynamic social aspects of group fitness classes (e.g., cohesion; Maher et al., 2015), this is the first study to our knowledge that has modeled exercisers' dynamic perceptions of groupness within the exercise environment across time. Using an intensive sampling methodology, we documented how fluctuations in perceived groupness are systematically related to important psychological and behavioral variables, though our models were primarily predictive at the within-person level. Broadly speaking, fitness classes are perceived more positively and relate to greater recalled exertion when they are perceived to be higher in groupness.

Postexercise recollections of exercise enjoyment and affective valence are core evaluations of fitness experiences that shape the social–cognitive evaluations of exercise (e.g., anticipated affect and intentions), which are key determinants of exercise adherence and maintaining a physically active lifestyle (Ruby et al., 2011; Zenko et al., 2016). Although studies have linked group cohesion to exercise satisfaction (Maher et al., 2015), the current findings demonstrate how class-to-class changes in perceived entitativity are positively associated with exercisers' reports of enjoyment with the fitness class, as well as perceptions of recalled affective valence during exercise. Given that group structure was not significantly related to recalled affective valence, the results indicate that entitativity may be a more salient feature for these aspects than the presence of group communication, roles, and norms within a fitness class. Drawing attention toward the recalled nature of affective valence, it is plausible that either these effects could demonstrate that (a) groupness shapes the immediate exercise experience or (b) individuals more readily access the positive affective and enjoyment elements when exercising in classes featuring high groupness. Although it is essential to disentangle these two processes, these relations between groupness and recalled affective valence and enjoyment produce compelling findings regarding how high perceptions of groupness could impact exercise cognitions.

It is generally expected that individuals will make more positive evaluations about a collective of individuals when it feels more like a true group (i.e., "we"; Stevens et al., 2019). Considering that recalled enjoyment and affective valence perceptions were formed within the context of groups, links to groupness align with social identity theory. We anticipate that a collective of exercisers that feels more like a true group has greater potential to become internalized into a person's sense of self identity, which may imbue the exercise session with deeper meaning for the individual (Haslam, Cruwys, Haslam, Dingle, & Chang, 2016). Greenaway et al. (2016) surmised that identifying with a group facilitates constructive helping between members (e.g., support) that enables individuals to overcome challenges and stressors. Given that intense physical activity entails predominately negatively valanced affective evaluations, exercising with a group that one identifies more closely with may enhance exercisers' postclass affective recollections of the experience. However, joining an intact "true" exercise group is not always a feasible option. For example, joining an authentic exercise group requires that members always meet at a rigid time that may not work well with other life demands (e.g., children). As such, drop-in style group fitness classes that resemble an authentic group may foster a group identity that shapes immediate evaluations and (potentially) more distal behaviors alongside one's sense of self.

Considering alternative explanations for the link between groupness and recalled exertion, exertion may also represent a "sacrifice" that generates stronger groupness perceptions (Swann, Gómez, Huici, Morales, & Hixon, 2010). That is, a collective of exercisers exerting themselves may feel a sense of incongruity if the setting they are doing so within is not a true group and, as such, people are motivated to justify their effort by increasing their perceptions of groupness. As theoretical support for this argument, researchers have indicated that sharing painful experiences—even with complete strangers—can enhance interpersonal relationships with

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those people (Bastian, Jetten, & Ferris, 2014). Considering that this compelling alternative is as-of-yet untested, a future direction is to conduct experimental research that manipulates physical exertion (i.e., randomly assign individuals to high or low intensity) alongside the structure of group environments (i.e., randomly assign to high or low group interaction). By measuring perceived exertion and groupness in these varying environments, researchers may better understand the temporality of the association between groupness and exertion.

Additional theoretical implications for this research emerge through findings that exercisers reported greater recalled exertion concurrent with more positive recollections of affective valence when groupness perceptions were higher. These findings raise questions about why groupness and recalled exertion are associated, and how groupness may influence the exertion–affect association. Although we anticipated that exercising in a group provides social motives for putting forth or perceiving greater effort, intense feelings of exertion are generally an unpleasant feeling for many individuals (Ekkekakis, Parfitt, & Petruzzello, 2011). Thus, the finding that participants reported feeling that the exercise class was harder when groupness was high is somewhat contradictory to the finding herein that participants recalled feeling greater enjoyment and more affective valence when groupness was high.

Of course, past evidence for associations among the concepts of exertion and affective valence mean that it is also important to consider these results synergistically. Because groupness was positively associated with both affective valence and exertion, it is prudent to consider whether groupness may moderate or confound the exertion–affect association. Even though high-intensity training results in physiological gains related to long-term health, many individuals experience negative affective valence during high-intensity exercise—leading to concerns about the risks of promoting high-intensity training to the general population (e.g., Ekkekakis et al., 2011). The idea that social forces may play a role in this association is supported in recent research: Compared with individual workouts, participants in "true groups" felt more intrinsically motivated to engage in high-intensity exercises (Martin et al., 2016). Although these findings provide preliminary support for exploring these associations, an understanding of the role of groupness demands a more diverse population and a wider spectrum of exercise intensities.

Practical Implications

In addition to advancing group dynamics theory applied to exercise, the current study holds several practical implications. A primary takeaway from the current findings is that perceptions of groupness are related to more positive postexercise cognitive evaluations. As a result, group exercisers' experiences may be enhanced by facilitating perceptions that class members are not only exercising alongside one another, but are indeed exercising *together*. This suggestion is consistent with a growing body of research on ways of enhancing social evaluations of group-based physical activity. For example, among older adults, physical activity groups are perceived more positively when the members are more similar in age (Bennett et al., 2018). Researchers have also found that exercisers perceive greater entitativity and group structure in classes that involve more opportunity for member interactions, in larger classes, in classes that do not require equipment, and in classes that entail synchronous movement among members (Evans et al., 2019). Nonetheless, as the current study entailed a correlational approach, additional work is required to provide stakeholders with a clear set of guidelines for promoting groupness.

Beyond the context of drop-in style group fitness classes, the implications of this research could extend to other domains of group-based exercise. A real-world illustration of group exercise that is also grounded in the social identity approach is parkrun; a weekly community event where individuals of all ages and abilities meet in a park to complete a 5-km run (see Stevens et al., 2019). Leaders of parkrun highlight clear group norms prior to each run (e.g., support fellow runners, even if you must sacrifice a personal best), and encourage a sense of togetherness alongside continual reminders that it is not a race. Applying the current findings to parkrun, as an example, stakeholders may be able to prompt greater levels of enjoyment, positive affective valence, and exertion (or enhanced postexercise recollections of these constructs) by creating a group setting that provides

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clear sentiments of entitativity and group structure.

Limitations

In addition to its strengths, there are limitations to the current study in terms of sampling as well as decisions related to measurement and methodology. To maximize ecological validity, the current sample was limited to participants who self-selected into a membership at a group fitness facility and consisted primarily of women. This could create range-restriction issues and hamper our ability to detect associations between constructs of interest. The nature of the current sample also limits the potential to generalize these results to inactive or diverse populations who may gain the most from group-based exercise (Harden et al., 2015). Although sampling exercisers from "drop-in" style group fitness classes advances the literature in this domain, most participants attended many classes over the course of the 2-week study period, which may lead to closer connections with fellow exercisers than one would typically expect through a drop-in setting. Nevertheless, we argue that the ecological validity is strong given that the group fitness facility that participants were drawn from is representative of this type of exercise setting.

Regarding methodological limitations, the results of the MCFA on groupness supported the theorized two-factor model. Nevertheless, the high interfactor correlations between these two factors indicate that exercisers' perceptions of group structure and entitativity carry potential overlap. Whereas we computed indices within analyses as evidence that collinearity was not a concern, additional research studying the measurement of groupness is critical to provide further support for its discriminant validity—particularly among the two subscales. We also note that the findings may be confounded by common method bias given that all data were self-reported, several of the items used similar scaling, and all items for each class survey were completed at the same time. Although this limitation is prevalent across the sport and exercise psychology literature, we encourage researchers to overcome this weakness in future studies by assessing variables on a variety of scales (e.g., visual analog scale; Zenko et al., 2016), or through means other than self-report, such as video coding. Pertaining to the single-item measure used to assess exercisers' enjoyment, the response scale used for enjoyment (i.e., *not at all* to *very much so*) does not capture that bipolar nature of enjoyment. That is, a bipolar scaling where options range from *I enjoyed it* to *I hated it* is more appropriate (Kendzierski & DeCarlo, 1991).

The timing of assessments should also be considered as to distinguish the postexercise reports captured within the current research from the theoretical value of assessments taken *during* exercise tasks. Considering that participants' responses of all study variables were recorded within 10 min following fitness classes, responses may have been confounded by recall biases whereby the exercise itself may have been unpleasant, but having completed the workout feels great afterward. As described earlier in this discussion, the group environment may also lead to more positive recollections than the aggregate of perceptions during the activity itself. Expectations that recalled perceptions are likely to vary in contrast to participants' actual experiences are indeed supported by the observation of relatively positive evaluations represented in the high means for enjoyment, exertion, and affective valence. Although data were collected as immediately following exercise as possible, it is prudent that future work develop methods for assessing these constructs *during* exercise in a naturalistic setting without hampering exercisers' experiences—while also integrating additional approaches to ensure truthful responding.

Whereas decisions to record postexercise evaluations were logical on one hand (e.g., logistical hurdles to capturing these variables during exercise in a community fitness center), these decisions are also bound to theory given the unique value of recalled affect. Notably, research grounded in behavioral economics has demonstrated that when exercise experiences are registered in memory as more enjoyable, they lead to more positive anticipated affect for future bouts of exercise, which is predictive of exercise intentions and adherence (Conner, McEachan, Taylor, O'Hara, & Lawton, 2015; Zenko et al., 2016). Thus, despite limitations of postexercise sampling, recollections of exercise experiences nevertheless hold conceptual and practical value for understanding exercise behavior.

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Alongside benefits to studying group exercise classes in a naturalistic community setting, the variability in class type (e.g., cycling) may introduce confounds. This limitation may be most relevant to exercisers' reports on recalled exertion, whereby the level of exertion may be reflective of the class setting rather than an exerciser's engagement of effort. Future work may consider assessing participants' perceived effort rather than exertion. Finally, we were unable to track participants' exercise behaviors beyond the 2-week study period, meaning that we were limited to studying proximal outcomes that may be associated with exercise adherence, but unable to track actual adherence. Future research should explore this avenue to understand the direct association between groupness and exercise adherence, and to also test whether the perceptions of recalled affective valence and enjoyment mediate this association.

Conclusion

One method of increasing physical activity in adults, which has theoretical and empirical support, is participation in group fitness classes (Eys & Evans, 2018). Our findings advance this literature by showing how fluctuations in exercisers' perceptions of groupness explained a considerable portion of the variance in recalled exertion, enjoyment, and affective valence, which are theorized to be key determinants of physical activity. Specifically, when groupness was higher during fitness classes, greater exertion was reported and exercisers held higher perceptions of enjoyment and affective valence. Ultimately, as it pertains to fitness classes, groupness is a positive perception that may be proximally targeted in attempt to promote exercise adherence.

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- To be selected, it is critical to be a regular reader of the five to six empirical journals that are most central to the area or journal for which you would like to review. Current knowledge of recently published research provides a reviewer with the knowledge base to evaluate a new submission within the context of existing research.
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