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Good vibes are contagious: Exploring within- and between-person predictors of grit in group environments

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Abstract

The groups we belong to and people we surround ourselves with can influence our goal pursuit through the types of goals we pursue and effort we put into pursuing them. Grit is one psychological construct encompassing passion and perseverance for goals that has yet to be thoroughly examined as it emerges across specific contexts. This thesis explored how perceptions of the group environment and group member goal interest and perseverance interact to influence individuals' context-specific grit. Study 1 examined a student club sample to investigate between-person associations of variables across groups exhibiting different levels of perceived interdependence. Study 2 aimed to explore within-person variability in associations by employing an intensive longitudinal design with competitive rowers. Results across both studies found club members' and rowers' grit for group-related goals were predicted by their perceptions of group members' grit. Findings support tenets of theoretical models explaining how people pursue goals within groups.

Keywords

Summary for Lay Audience

It is widely accepted that the people we surround ourselves with and the groups to which we belong to can influence us. Thinking specifically about goal pursuit, our peers and coworkers can impact how dedicated we are in working toward our goals or even the types of goals we aspire to in the first place. Grit is described as the maintenance of interest and persistence of effort over time while pursuing goals, and we know relatively little about how group settings play a role in shaping a person's grit. Two studies explore how someone's grit when pursuing goals within groups is related to their perception of other group members' grit and how much they feel as though they rely on other group members.

The first study sampled students who belong to clubs at Western University and asked them to fill out one survey about their grit thinking about club-related goals as well as how they view other group members' grit. The second study sampled competitive rowers and asked them to fill out eight identical weekly surveys over the course of two months on their grit for rowing goals, their teammates' grit for rowing goals, and what their training was like each week. Both studies also asked participants about how much they rely on other members to execute tasks that are a part of group membership.

Overall, it was found that when people feel their peer group members or teammates are highly interested in group-relevant goals, they report more interest in these goals themselves. Similarly, when people report other group members as perseverant, they also report being more persistent for their own goals. Importantly, these relationships were most noticeable when individuals felt interdependent with group members to perform group-relevant tasks or to achieve in their own goals. This research suggests that when we think about how groups influence our goal pursuit, grit might be an especially important factor. When we view others in our group as being particularly 'gritty' in pursuing group-relevant goals, we may feel more interest or perseverance toward our own pursuits.

Co-Authorship Statement

I would like to acknowledge the contribution of Dr. Blair Evans as a co-author of this thesis. He contributed through the development of research ideas and provided feedback on data analyses of both studies and the writing process. I would also like to acknowledge contributions of Karissa Riley who co-authored Study 2. Karissa prepared the ethics application for this study and provided feedback on the survey development and results interpretation.

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Chapter 1

1 General Introduction

While the goals we pursue may feel like our own, they are often tethered to our relationships and the groups within which we belong. These influences can be overt and concrete, like when others provide social support that helps us to achieve goals. Social influences on goal pursuit can also happen in ways that are less explicit. Fitzsimons and Finkel (2010), for instance, documented experimental studies revealing several surreptitious social influences on: (a) goal selection (e.g., priming significant others also primes goals that those people view as important; Shah, 2003), (b) self-regulation toward goals (e.g., high-maintenance social interactions worsen self-control in subsequent tasks), and (c) how people evaluate goal progress (e.g., upward social comparisons often dampen perceptions of goal progress; Suls et al., 2002). Social influence on goal pursuit is widespread and impacts not only our choice of goals and our commitment to them, but also the extent to which goals are salient and embraced.

Social influence is, however, not just a one-way street. When we pursue goals, others who we spend time alongside do as well – it is a transactive process where people influence one-another's pursuits. This transactive process may be unique within small groups that have a widespread social influence, as people belong to numerous small task-performing groups or teams across areas of their lives. For example, group membership can guide the types of goals we choose to pursue, and other group members can encourage or impede our goal achievement (Diekman & Steinberg, 2013).

In this thesis, I demarcate teams in alignment with the definition proposed by Kozlowski and Ilgen (2006) which describes teams as "(a) two or more individuals who (b) socially interact (face-to-face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes…" (p. 79). I focus on how people pursue goals as members of groups featuring these characteristics. The interdependence, interactions, and shared social structures inherent in teams are what can

make these environments potent influences on individuals and rich environments to examine goal pursuit. I examine these associations through a package of studies including undergraduate student clubs as a group environment (Study 1) as well as goal pursuit in competitive sport, with rowing clubs as the groups of interest (Study 2).

1.1 Social Influence in Groups

The effects of being in a group and the influence people have on each other's behavior has been thoroughly researched (Brown & Pehrson, 2019; Cialdini & Goldstein, 2004); with findings consistently demonstrating the people we surround ourselves with and the groups we belong to can significantly impact our attitudes, behaviors, and more. As one example, research by Dik and Aarts (2007) demonstrated how perceiving effort in the movements of an agent can produce a contagion effect and increase individual's goal-directed behavior. These findings bolster arguments for the potential impact of others on individual goal pursuit intentions – but existing findings may not generalize toward groups. Much of the literature characterizing social influences on goal pursuit has not used intact group settings but has instead leveraged social referents or influences that are either (a) significant others (e.g., intimate relationships, close friends, family members), or (b) contrived social situations in experimental settings. Few researchers have quantitatively unpacked social influences on goal interest and goal perseverance as it naturally unfolds within real-life small groups.

There is a broad scope of theoretical arguments for the mechanisms through which group environments enact social influence on individuals including: social support, direct and indirect social control, social comparison, and group positive affect. Many of these "pathways" of influence are indirect and affect group members by facilitating goal effort without explicitly targeting goal pursuit. For example, social support has been associated with increased wellbeing although it is unlikely individuals are actively aware of the impact this perceived support has in their daily life (Taylor, 2011). Additionally, simply the experience of high positive affect within groups promotes commitment and decreases absenteeism – meaning that groups can promote engagement simply because they are enjoyable (Peñalver et al., 2020). In contrast, direct pathways, including social control or

explicit action to change group members' attitudes or behaviors, offer an unambiguous explanation for how group environments influence individuals (Craddock et al., 2015).

Research exploring social influence presents exciting findings. Yet there is a need to establish clear theoretical mechanisms regarding why or how group members' goal pursuit relates to one another. As the literature advances, it is also important to identify consistent constructs as features of goal pursuit being identified and studied across disciplines. One construct that incorporates the role of both interest and perseverance in goal pursuit is grit. Leveraging grit in the current research, two distinct aspects of goal pursuit that may relate to group environments are distinguished. At a theoretical level, I also employ transactive goal dynamics theory to explain why or how the link between grit and goal pursuit in group environments exists; as well as contextual features of relevance that may play a role in key associations. Incorporating comprehensive theoretical support for relationships of interest and a lens through which elements of goal pursuit can be elucidated, I aim to study social influence with a targeted approach grounded in established measures and theory.

1.2   Grit

Grit was initially proposed by Duckworth et al. (2007) as "perseverance and passion for long-term goals" (p. 1087) to explain variance in individual performance. The inspiration behind the development of grit as a psychological construct involved identifying individuals who persistently embrace their interest and effort in key performance-based activities like medicine, military training, music, and sport. Grit is conceptualized as a two-facet construct, combining consistency of interest (i.e., tendency to remain devoted to the same goal across time) and perseverance of effort (i.e., tendency to maintain effort despite failure or plateaus in progress).

Grit was established through the psychometric development of self-report tools. In implementing these surveys, researchers have established grit's predictive value relative to individual performance. For example, a cross-cultural meta-analysis reported the pooled bivariate correlation between academic performance measures (e.g., GPA or continuation in school) and grit to be $r = .19$; this association is comparable to other non-

cognitive predictors of academic achievement (Lam & Zhou, 2022). In terms of athletic performance, a recent scoping review reported similar significant and positive correlations between grit and sport-based performance and engagement (Cormier et al., 2021). Grit has also been studied in the workplace where it has been shown to be positively correlated with retention, work engagement, and job performance as well as negatively correlated with burnout (Southwick et al., 2019).

One prominent concern raised in response to grit research is that the construct may be a victim of the jangle fallacy and just a repackaging of conscientiousness or persistence (Credé et al., 2017). Meta-analytic findings indicate the overall correlation between conscientiousness and grit to be $\rho = .84$ ($k = 22$, $N = 18,826$, $SD_\rho = .07$). Amid these criticisms of the novelty of grit and potential construct proliferation, three distinguishing aspects of grit have been proposed to be: (a) it is a compound of both consistency of interest (passion) *and* perseverance of effort (perseverance), (b) it is sustained over an extended period, and (c) it is conceptualized as a dispositional trait rather than an activity-specific state (Southwick et al., 2019). Grit theorists have used these key characteristics to defend the construct and its uniqueness. For instance, focusing on the consistency aspect of the construct, theorists emphasize ideal studies of grit capture the construct or its outcomes longitudinally.

Table 1 illustrates similar constructs as well as their distinction from grit considering these definitional elements. One particularly similar construct is resilience. Whereas grit and resilience both feature aspects of goal pursuit and persistence, their key contrasts relate to the experience of adversity and the importance of passion. Resilience is defined in light of one's response to adversity. While grit can be shown in response to setbacks, adversity is not vital to its definition. Further, grit incorporates the notion that interest for a goal remains consistent, which is not integral to resilience. Grit is a facet of conscientiousness in so far as it refers to voluntarily expending effort towards a goal. Although, definitions of conscientiousness differentiate from grit as they do not include the consistency of interest element in grit, nor the long-term stamina required. Growth mindset, referring to an implicit belief about one's ability to change their intellectual abilities, is discerned from grit which is a behavioral tendency within an individual.

Table 1 Distinguishing Grit from Relevant Constructs.

Construct *Definition of Construct*	Contrast with Grit
Resilience *"Potential to exhibit resourcefulness by using available internal and external recourses in response to different contextual and developmental challenges" (Pooley & Cohen, 2010, p. 34)*	No indication of consistency of interest (passion) or need for extended timeframe and unlike grit, resilience cannot exist without adversity. Meta-analytic correlation with grit $\rho = .09$ ($k = 3$, $N = 480$, $SD_\rho = .09$) (Credé et al., 2017)
Conscientiousness (Big 5) *"Spectrum of constructs that describe individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding" (Roberts et al., 2014, p. 1315)*	Grit is a facet of conscientiousness due to voluntary expenditure of effort toward outcome, but conscientiousness does not emphasize long-term stamina, nor does it include passion or the notion that individuals remain committed to the *same* goal over time. Meta-analytic correlation with grit $\rho = .84$ ($k = 22$, $N = 18,826$, $SD_\rho = .07$) (Credé et al., 2017)
Trait self-control *"The capacity to alter or override dominant response tendencies and to regulate behavior, thoughts, and emotions" (de Ridder et al., 2012, p. 77)*	Consistency of interest is not essential to self-control nor is there a defined requirement for extended timeframe. Meta-analytic correlation with grit $\rho = .72$ ($k = 4$, $N = 2,615$, $SD_\rho = .05$) (Credé et al., 2017)
Passion Harmonious passion: *"Autonomous internalization that leads individuals to choose to engage in the activity that they like"* *(Vallerand et al. 2003, p.2003)* Obsessive passion: *"A controlled internalization of an activity in one's identity that creates an internal pressure to engage in the activity that the person likes" (Vallerand et al. 2003, p.2003)*	No inclusion of perseverance of effort or extended timeframe and harmonious passion is an activity-specific state rather than a trait. Correlation between grit and harmonious passion $r = .32$, $p < .01$ (Jachimowicz et al., 2018)
Growth Mindset *"Belief that your basic qualities are things you can cultivate through your efforts, your strategies, and help from others" (Dweck, 2006, p.7)*	No inclusion of passion or need for extended timeframe and growth mindset is not considered a dispositional trait. Correlation between grit and growth mindset in multiple cross-sectional studies ranges from $r = .13-.18$ (Park et al., 2020)

The development of grit and a growth mindset may be associated with each other over time (Zhang et al., 2022) although the mechanisms through which this occurs have only been theorized. This body of literature certainly confirms that grit clearly overlaps with several concepts relating to goal pursuit, and that each of these concepts may also be important topics when studying social influence and goal pursuit. Yet, grit entails a unique combination of key facets and focuses on both consistency of interest and perseverance of effort in pursuing goals of interest.

1.2.1 Translating Dispositional Grit to the Pursuit of Specific Goals

Associations between grit, performance, and other related outcomes, nevertheless, do vary in relation to key contextual and personal features. In other words, grit is a noncognitive trait that can manifest differently within an individual across situations and experiences. Although grit is conceptualized as a dispositional trait, the instrumentality of interest as a component enables its malleability across contexts. For example, researchers found domain-specific grit focused on schoolwork predicted student-athletes GPA, beyond the variance predicted by a 'global' grit scale (Mosewich et al., 2021). As another example, grit appears to be a more significant predictor of job performance when employees exhibit context-specific passion for their work (Jachimowicz et al., 2018). This context-specific variability indicates that grit may manifest uniquely across domains of our lives (Mosewich et al., 2021). While dispositional grit may constrain just how much we vary in interest and effort, there is evidence that grit can fluctuate. 'Gritty' individuals are likely to pursue goals across all areas of their life with perseverance however, when experiencing context-specific interest for goals, they will pursue goals in these areas with greater persistence.

Variability over time is another important consideration. Despite conceptualization as a disposition or trait that may extend across settings, theorists anticipate that grit can change with time and can be developed or supported in specific contexts. Cross-sectional data have shown positive correlations between grit and age (Camp et al., 2019; Duckworth et al., 2007) suggesting grit may increase with age. There is also evidence grit can be influenced and increase in a relatively short period of time as explored by Rhodes

et al. (2018), who found a Functional Imagery Training (FIT) intervention could influence grit among professional soccer players. Results demonstrate how environmental factors can impact grit scores and how an individuals' grit may fluctuate over a relatively short period of time. One note is that these studies focus on variability in terms of growth, yet there is conceptual support for the expectation that grit can fluctuate similar to other markers of goal salience.

Translating grit also involves considering how dispositional grit manifests in relation to specific goals. Considering how the originally posited grit facets appear in more acute weekly goal pursuits in specific contexts, individuals are gritty to the extent they remain interested in and persevere with these goals, maintaining motivation for context-specific goals. Remaining consistently interested in the same area of goal pursuit or specific goal(s) across weeks and months is a demonstration of passion as it is defined within grit. Additionally, remaining committed to and pursuing these goals even in the face of setbacks over time is an indication of the perseverance facet of grit.

Trait activation theory (Tett & Burnett, 2003) is one useful way to understand the manifestation of grit – as a disposition – within specific moments and contexts. The theory posits personality traits as predispositions to behavior rather than absolute determinants. When individuals experience situational cues relevant to these predispositional traits, they will express them thereby gaining intrinsic satisfaction (Tett et al., 2013). As such, individuals are likely to possess a dispositional level of grit unique to them which leads to relevant behaviors when circumstances are suitable. In relation to the activation of grit, there are a few notable trait-relevant situational features introduced by Tett and colleagues (2013) that appear pertinent. Situation strength (i.e., the relative structure and constraints present in a given context) may play an important role in grit variance across situations. Contexts with high levels of structure, consistency, and constraints to the available options – alongside reinforcements for behavior – mean that individuals' dispositional traits have smaller effects on performance outcomes (Judge & Zapata, 2015). Applied to a sport example, spending a week at a training camp with few other demands on one's time might reduce the salience of grit (i.e., it is easy to pursue sport goals in this setting). But, when in the messiness of daily life and amidst a range of

competing demands and reinforcements, then grit in a specific domain may become very salient. Therefore, within-person fluctuations across various contexts and points in time are likely a result of the relevance grit has for the individual in that scenario as well as the relative strength of the situation outlined by theory.

The body of evidence demonstrates that self-reported grit varies across situations and over time. There is a wide scope of potential variation in the degree of grit one exhibits situationally (i.e., from one goal setting to the next), temporally (i.e., in the same setting, but from one moment to the next), and between people. Situational and temporal variability provides an opportunity to explore the extent to which group environments may predict such variability.

Whereas grit has been extensively studied at an individual level, fewer studies have examined grit in a team setting by considering how group members influence one-another's grit. An understanding of how individual's goal interest and perseverance develop in a group setting should consider differences in dispositional grit, within-person fluctuations across various timepoints, as well as potential routes social influence may take. Adequately unpacking grit in a group context begins with a robust understanding of how membership in groups has an impact on individuals' lives.

1.3   Transactive Goal Dynamics Theory

Transactive goal dynamics theory (TGD) is an emerging model to understand how relational dynamics influence goal pursuit and group outcomes (Fitzsimons et al., 2015). The theory was originally posited to explain the influence of close dyadic relationships in goal pursuit behavior and outcomes, but Fitzsimons and colleagues (2016) extended theorizing to group contexts such as workplace teams. Focusing on the psychological mechanisms and contexts that shape how goal pursuit is influenced by close others and groups, TGD is positioned as an integrative framework to draw together several emerging insights about self-regulation. Recalling the previous presentation of direct and indirect social influences in groups, processes implied by TGD explain how and when members are influenced by teammates during goal pursuit, without specifying distinct aspects that are impacted. Fitzsimmons and colleagues (2016) emphasize that independent agents

self-regulating toward their own goals often nevertheless share interdependent goals and can function as a system where other members can adopt roles or influences within one's goal pursuit. Thus, one key insight from this approach is the mere recognition that members of groups or partners in a relationship each function within a broader system of goal pursuit with interdependencies that are both explicit and implicit.

Figure 1 presents several key tenets of TGD as they relate to group settings. A particular component of teams, as posited by TGD, is that members often experience high *transactive density*, reflecting the extent to which members have interrelated goals and pursuits within a shared system of goal-relevant resources (Fitzsimons et al., 2016). Transactive density refers to a state in which teammates experience their goal pursuits to be tightly intertwined. Transactive density is shaped by both (a) motivation, to the extent that team members view their goals, pursuits, and outcomes as self- versus team-oriented, and (b) opportunity, to the extent that situations require or promote social interaction and goal interdependence.
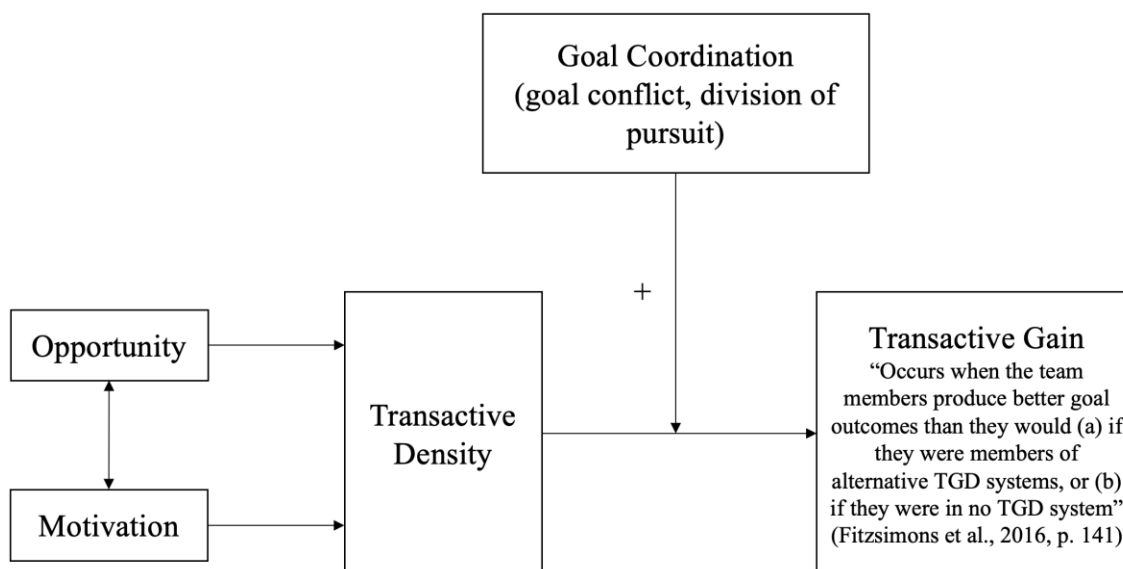
Figure 1 Variables and relationships posited by transactive goal dynamics theory in teams.

Note. Adapted from Fitzsimons et al. (2016), this framework emphasizes how transactive density among group members can generate transactive gain. It also posits members are more likely to produce improvements in goal pursuit when goal-directed actions are

coordinated efficiently, and related contextual features are met (e.g., members are aware of one-another's goals).

The primary argument of TGD is that transactive density increases the potency of social influence toward goal pursuit. High transactive density does not inherently produce cooperation or support. However, it creates the conditions for what is termed transactive gain – a hypothetical outcome of shared goal pursuit. Transactive gain fundamentally is the notion that team members experience better goal outcomes in the system than they would without others present, and can be evident in numerous ways (e.g., teammates prime one's goal pursuit; teammates support goal efforts). A further tenet of TGD is that goal coordination moderates the outcomes of transactive density across phases of goal initiation, operation, and maintenance. When members experience certain conditions within their group, like a clear understanding of what all other members are pursuing, the team is better situated to produce transactive gain.

Most of the research exploring TGD has primarily looked at dyadic relationships and goal achievement. For example, Kornblum et al. (2021) studied tenets of TGD through an examination of romantic partner's influence on relative political career goal attainment. Transactive density was measured through relationship duration, closeness, and shared career goals. Results demonstrated relationship closeness had a positive effect on perceptions of shared career goals and these perceptions of closeness and sharedness predicted career attainment. Studies exploring the influence of dyadic relationships in goal pursuit and subsequent transactive gains are considered alongside theory extension implicating similar processes in groups to provide a strong basis for how my research is conceptualized.

1.4   Current Studies

Whereas we know a great deal about social influences on goal pursuit, less is known about these processes as they unfold within small groups and shape the manifestation of grit. Although grit is trait-like in nature, its variability across situations opens the door for small group environments to activate – or suppress – individuals' propensity to pursue goals with passion and perseverance. Additionally, both facets of grit (i.e., consistency of

interest and perseverance of effort) have frequently emerged as relevant factors in goal achievement across settings. Considering how the originally-posited grit facets appear in context-specific goal pursuits, individuals are gritty to the extent they remain interested in and persist with these goals. My studies measure grit subscales as goal interest and goal perseverance because: (a) psychometric studies of grit reveal that these two facets are often distinguishable, and (b) I anticipated the two scales to exhibit unique variability relative to one another in goal-specific contexts.

The current research explores how self-referent goal interest and perseverance – as assessed through grit dimensions – are related to perceptions of group environments within which one pursues specific group-relevant goals. There are many ways to explore social influence and goal pursuit, and my thesis focuses on the link between the grit that oneself has displayed in the most recent week as well as that which is perceived among one's teammates. This work therefore made two adaptations to existing measurement of grit to accommodate an estimate of social influence. First, I contrast between self-referent goal interest and perseverance (i.e., individuals rate themselves, similar to traditional tools) and group-referent goal interest and perseverance (i.e., a novel approach, asking participants to reflect on teammate goal pursuit). Second, I focused participants to consider grit relating to their specific group-related goals, and to consider interest and perseverance within the most recent weeks' time.

Across two papers, my thesis integrates conceptualizations of grit alongside transactive goal dynamics theory to better understand how perceptions of teammate's goal pursuit relate to the manifestation of one's own grit, while also understanding key moderators and potential outcomes. I theorize that members will exhibit a tendency to experience transactive gain, reflected in the extent their self-referent grit is associated with their group-referent grit. Thus, the association between one's own grit and that perceived of teammates is in a sense the outcome of the transactive process within teams. I also posit interdependence as one critical moderator of this association. Transactive gain (i.e., association between self- and group-referent grit) is more likely when members perceive their outcomes or task involvement as closely interdependent with others in the group. Furthermore, Study 2 explores additional contextual variables posited by TGD as being

associated with transactive density as well as potential outcomes associated with variables of interest. While both studies broadly address a common topic, specific deviations in design and hypotheses situate them as distinct yet related pieces in the puzzle.

The primary research question of my thesis explores how self-referent grit (i.e., goal interest and goal perseverance) relates to group-referent grit. Direct and indirect forms of social influence have been associated with various individual outcomes including individual wellbeing (Peñalver et al., 2020), organizational commitment (Siciliano & Thompson, 2018), and changes in individual interests (Bergin, 2016). Further, grit has been posited to fluctuate across specific contexts (Jachimowicz et al., 2018) and situated as a relevant factor in goal-related outcomes (Duckworth et al., 2007). As have close interpersonal relationships been associated with goal pursuit (Hofmann et al., 2015). Therefore, while emerging dynamics between self- and group-referent context-specific goal interest and perseverance have yet to be explored, there is a strong basis in prior research to support the notion that they will be related.

In line with TGD theory, there may be key aspects of the group environment which impact the relationship between perceptions of other members' goal interest and perseverance and one's own reported goal interest and perseverance. Notably, interdependence is one factor which significantly contributes to the emergence of transactive density in teams; without interdependence between group members' goals, pursuits, and outcomes, there is no transactive goal dynamics system (Fitzsimons et al., 2016). Without any amount of transactive density in a group, there is limited theoretical basis for my prior research question pertaining to the relationship between self- and group-referent grit. In both studies, I explore potential moderating effects of perceived interdependence.

One further goal of this research is to confirm the factor structure of grit measures and examine whether the two-facet construct emerges in current samples. Whether grit is best conceptualized as a single facet construct or as a latent construct comprised of two facets has been debated and scale structure analyses have provided mixed results. A meta-

analysis examining whether grit is an effective predictor of relevant performance variables found combining the two facets into one higher order construct reduced the predictive value of grit (Credé et al., 2017). Further, Duckworth and colleagues (2021) have discussed the limitations of the originally posited grit scale construction and conceptualization of grit as a higher order construct with two dimensions. I explore how measures of context specific grit (e.g., goal interest and goal perseverance) exhibit similar or dissimilar factor structures of trait-level grit measures.

Chapter 2

2   Study 1

Study 1 examined the goals of the present research within the context of small- to moderate-sized student clubs and organizations. Student clubs are an optimal sample for this research based on intersections of goal-oriented groups and relative convenience. Clubs at post-secondary institutions are a voluntary extracurricular activity where students have opportunities to expand their social horizons and connect with others based on similar interests or goals. This aligns with my aim to examine context-specific grit in group settings. Therefore, sampling from student clubs offers both opportune access to multiple groups alongside a context that is theoretically relevant to my thesis research questions.

A preliminary goal of Study 1 was to evaluate the psychometric characteristics of self- and group-referent grit and examine the properties of adapted versions of the existing scale. This step will assess factor structure of items from the original scale, when reworded to reflect specific group-related goals and to assess self-referent and group-referent ratings separately.

The primary purpose of this study was to examine the extent to which self-referent goal interest and goal perseverance in the context of club environments relate to perceived group-referent goal interest and goal perseverance. Examining club-relevant goals, I hypothesize that:

> *H1: Between-person variation in self-referent goal interest/perseverance will be related to between-person variation in group-referent goal interest/perseverance.*

Additionally, in line with relationships posited by TGD, perceptions of interdependence in the group environment are implicated in the emergence of transactive density. My second hypothesis is that:

> **H2:** *Individual perceptions of club-related interdependence will moderate the relationship between self-referent goal interest/perseverance and group-referent goal interest/perseverance.*

An important observation is that there are four possible combinations of these variables that may produce different effects (i.e., self-/group-referent; interest/perseverance). Other than a general expectation that self- and group-referent scores would be more strongly associated when measured within the same dimension (i.e., goal interest or goal perseverance), I did not establish distinct hypotheses about relative strength or direction of these relationships for either H1 or H2.

2.1   Study 1 Methods

2.1.1 Participants

All participants were students at a large Canadian university who completed the survey as a member of an existing on-campus club. The sample ($n = 185$) contained 60 participants who identified as male (32.4%), 94 who identified as female (50.8%), and 31 participants did not disclose their gender identity (16.8%). The average age of participants was 20.05 years old ($SD = 2.21$), and the majority of the sample reported they were in their first year of club membership (57.5%).

Thirteen clubs were involved in the present research, and the average number of survey respondents per club was 14.15 members ($SD = 3.08$). Participants belonged to clubs within several categories including: (a) club level sport teams or clubs focused on training for or participating in sports (46%), (b) clubs centered around a common hobby or interest who come together to engage in related activities (23%), (c) clubs that come together based on shared endeavors (e.g., organizing regular fundraising initiative for philanthropic goals; 15%), and (d) clubs where members engage in discussions or activities primarily focused on a shared identity (15%). Additionally, 29% of participants who completed surveys indicated they had a formal role organizing their group (e.g., roles like president, treasurer, or communications).

The subset of participants in an executive or administrative role within their club completed additional demographic items to describe their clubs. The total number of registered members in sampled clubs ranged from 10-100. Club leaders also reported whether the average club member needs to work closely with other members on a regular basis as a part of club membership. Fifty-five percent of club administrators confirmed that average club members work closely together to achieve club outcomes.

2.1.2 Procedure

Intact clubs were recruited to participate in my study through initial contact with student club leaders, who were asked to invite me to join a group meeting for recruitment and study participation. Club leaders were contacted over email, or in person through my attending the annual university club fair. Once leaders agreed to have their club participate, researchers attended a club meeting in person to share the study information and invite members to participate in an online survey using their phone. All participants received a $5 gift card.

2.1.3 Measures

The study package consisted of peer nomination items – which were not relevant for the present study – followed by measures of context-specific grit, interdependence perceptions, and dispositional conscientiousness. Surveys concluded with a series of club and individual demographic items. Internal consistency for each scale-scored variable (i.e., Chronbach's α) is available within Table 4.

2.1.3.1   Demographics

Participants reported demographic information (e.g., age, gender), as well as how long they have belonged to the club and whether they are in an executive or administrative role within the club. Members who reported having formal roles in the club reported contextual information about the club including upcoming club events, requirements for task interdependence between members, and the approximate number of registered members.

2.1.3.2 Club-related Goal Interest and Perseverance (Grit) with Individual and Group Referents

Items from the Short Grit Scale (Grit-S; Duckworth & Quinn, 2009) were adapted to measure self-referent goal interest and perseverance in relation to club-relevant goals. All items were measured on a 5-point Likert scale (1 = *not at all like me*, 5 = *very much like me*). Participants were prompted to think about the goals they pursue in relation to their club and then asked: *"When you think about your efforts to pursue club-related goals this week, to what extent are the following statements accurate?"* Eight items measured self-referent grit with four pertaining to goal interest and four measuring goal perseverance.

On a subsequent page of the survey, participants were asked about their perceptions of other club members' pursuit of club-related goals. The same eight items from the self-referent measure were adapted to capture group-referent club-related goal interest and goal perseverance. All original Grit-S items and their adaptations, including self- and group-referent versions, are available within Appendix A.

2.1.3.3 Perceived Task Interdependence

Five items measuring task interdependence were adapted from Van der Vegt and Janssen's (2003) perceived task interdependence measure to reflect student club tasks as opposed to workplace tasks. Items were measured on a 7-point Likert scale (1 = *completely disagree*, 7 = *completely agree*). Participants were prompted to consider their goals within the club, and each item asked members to rate the extent they depended upon group members (e.g., *"I need to collaborate with other club members to perform club-related tasks well"*) or other group members depended upon them (e.g., *"my club members need information and advice from me to perform club-related tasks well"*).

2.1.3.4 Conscientiousness

Eight items were used from the 100-item version of the HEXACO-PI-R scale (Lee & Ashton, 2018). Items were selected from the organization and diligence scale of the conscientiousness domain and were all measured on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). One example, reverse-scored, item is: *"I do only the minimum amount of work needed to get by"*.

2.2   Study 1 Analyses

The first step of analysis involved checking the data did not violate key assumptions needed for linear regression (e.g., normality, homoscedasticity; Osborne & Waters, 2002). The assumption that variables are normally distributed was tested by assessing skew and kurtosis to determine if any ceiling effects or other indicators of non-normality were present. Testing the assumption of independence of error was done by producing residual plots for independent variables to visually assess for homoscedasticity. Multicollinearity is another problem that may arise in regression analysis when predictor variables are highly related (Thompson et al., 2017). To assess data for multicollinearity, I considered bivariate correlations as it has been suggested that strong correlations ($r >$ .85) can be an indicator of multicollinear predictors (Schroeder, 1990). Further assessing for multicollinearity, I computed variance inflation factors (VIF), a common statistic for determining the likelihood and relative impact of multicollinear variables (Thompson et al., 2017). As there are varying 'rules of thumb' present in how researchers interpret VIF values, I followed recommendations outlined by O'Brien (2007) to consider computed values in context of other factors that impact regression interpretation (e.g., sample size, proportion of outcome variance explained by model). At this stage, I also reviewed descriptive statistics, including intraclass correlation coefficients (ICC [1]) to aid decision-making about analytic approach.

Following this, I tested the hypothesized two-factor structure of the grit measures. Whereas self- and group-referent goal interest and perseverance measures were adapted from the previously validated Grit-S (Duckworth & Quinn, 2009), two types of modifications made it important to evaluate construct validity. The adaptations for this study included (a) framing the responses to pertain to the past week of club activities, and (b) constructing a group-referent version along with the self-referent version. I conducted confirmatory factor analysis (CFA) as well as exploratory structural equation models (ESEM) to evaluate factor structure. ESEM models used target rotation as there was an a priori factor structure (Marsh et al., 2014). Given ongoing debate about the single- or two-factor structure of grit scales, I contrasted both one and two factor solutions for self-

referent grit as well as group-referent grit. All scale analyses used maximum likelihood estimation.

Using the type = complex function in Mplus 8.9 (Muthén & Muthén, 2010) software, analytic output produced model fit indices (e.g., root mean square error of approximation, comparative fit index) that accounted for the nested nature of the data while still producing factors only at the within-person level. This function runs analyses only at Level 1 and applies Huber-White or sandwich estimation to produce cluster-robust standard errors (Maas & Hox, 2004). This accounts for the nested structure of the data by using more conservative standard error values. In samples with relatively few clusters, standard errors may still be misestimated (Cameron & Miller, 2015). However, the exact number of clusters needed is undetermined and the use of robust standard errors is still a commonly used method for accounting for clustering in complex data and does account for some misestimation of standard errors (Huang, 2018).

Primary analyses included regression models conducted in Mplus 8.9 (Muthén & Muthén, 2010) to examine the effects of club context perceptions and key predictor variables on self-referent goal interest and goal perseverance. Despite members being clustered within groups, I conducted only individual-level analyses because: (a) the individual-level analyses and interpretations were primarily of interest for this study, (b) there was a limited number of clusters (i.e., 13), and (c) there was low-to-moderate shared club-level variability across most constructs. Despite not using full multilevel models to decompose between and within-group levels, I followed recommendations by McNeish et al. (2017) and used the type = complex command (see above) while nevertheless maintaining analyses at only the individual level. Separate models were built for each dependent variable that included: (a) a multiple linear regression model with control variables (Model 1), (b) integrating focal predictor variables (Model 2), and (c) testing relevant moderators (Model 2a). Following these regressions, significant interaction terms in Model 2a, indicating moderation, were probed further, and graphed in Mplus. Variables were grand mean centered and I report standardized regression coefficients.

One important note pertains to the consideration of conscientiousness within regression models. Theorists and meta-analysts have recently highlighted the overlap in between-person variability when considering dispositional grit and conscientiousness. Whereas I adopted a modified grit measure to be more context specific, I anticipated that it would still be important to account for the role of conscientiousness in regression models predicting self-referent goal interest and perseverance. Researchers who study grit (Aguerre et al., 2022) often seek to partial out effects of related non-target variables on target variables to clarify associations of interest and remove extraneous influence of covariates (Hoyle et al., 2023). Similar approaches are adopted in studies with comparable types of variable overlap. For example, when examining correlates of narcissism, self-esteem is commonly partialed-out or controlled-for (Foti, 2012). Partialing can be accomplished by including non-target variables as controls in a regression. An alternative approach that is common, but not adopted herein, involves residualizing scores for the dependent variable (i.e., regressing grit onto conscientiousness, and then exporting residual scores for subsequent regressions). Although neither practice is without its drawbacks, the latter method of residualizing scores can be more problematic and difficult to interpret in smaller sample sizes (Hoyle et al., 2023). Therefore, my regressions predicting self-referent goal interest and goal perseverance values included conscientiousness as a *control variable* to partial out confounding variance.

2.3   Study 1 Results

2.3.1 Factor Analysis

Modelling was conducted in two phases. During the first phase, ESEM and CFA models were run with all eight self-referent grit items included. Model fit for a two-factor ESEM model was nearing adequate fit (RMSEA = 0.13; CFI = 0.75; SRMR = 0.08). Considering modification indices along with item loadings, two items ("*this week as a club member I gave up on some of my plans for club-related activities*" and "*this week as a club member I was not discouraged by setbacks*") were not loading well and were removed. I subsequently conducted a set of four models, including single- and two-factor solutions as well as using CFA and ESEM models; fit statistics are reported in Table 2.

Determining the best fit across models was done based on cut-off criterions of key model fit indices (e.g., RMSEA, CFI, SRMR) summarized by van Zyl and ten Klooster (2022). Two-factor CFA and ESEM models demonstrated optimal fit. As final model selection, I opted for the most flexible modelling approach – two-factor ESEM model (see Appendix B for MPlus input for final model) – and this approach was used to determine the factor loadings presented in Table 3. A parallel process was run with the group-referent grit scale, with the same two items removed; see Table 2 for model fit statistics and Table 3 for item loadings.

In sum, it was most appropriate to look at grit as a two-factor measure and examine goal interest and goal perseverance as separate variables – resulting in four variables: self-referent (SR) goal interest, SR goal perseverance, group-referent (GR) goal interest, and GR goal perseverance.

Table 2 Scale testing fit statistics.

Study 1 Models	SR Grit Scale			GR Grit Scale		
	RMSEA	CFI	SRMR	RMSEA	CFI	SRMR
One-factor ESEM	.14	.85	.07	.19	.77	.12
One-factor CFA	.13	.82	.07	.19	.77	.12
Two-factor ESEM	**.03**	**1.00**	**.02**	**.00**	**1.00**	**.02**
Two-factor CFA	.08	.95	.05	.09	.96	.07

Note. SR = self-referent, GR = group referent. Bolded values indicate final scale model.

Table 3 ESEM factor loadings for self- and group-referent grit.

Self-referent items (Intended dimension)	Factor 1	Factor 2
1. I set goals at the start of the week but ended up pursuing different ones (GI)	**.34****	-.04
2. I had difficulty maintaining focus on my goals (GI)	**.55****	.30*
3. I was distracted from previous ideas by newer club-related ideas and projects (GI)	**.74****	.01
4. I worked exceptionally hard in pursuing my goals (GP)	-.08	**.71****
5. I finished whatever I began (GP)	.21*	**.50****
6. I was diligent in pursuing my goals (GP)	.01	**.76****
Group-referent items (Intended dimension)		
1. Members of my club appeared to set goals at the start of the week but end up pursuing different ones (GI)	**.40****	-.22**
2. Members of my club appeared to have difficulty maintaining focus on their goals (GI)	**.51****	.14*
3. Members of my club appeared to be distracted from previous ideas by newer club-related ideas and projects (GI)	**.88****	.02
4. Members of my club appeared to work exceptionally hard in pursuing their goals (GP)	-.09*	**.78****
5. Members of my club appeared to finish whatever they began (GP)	.05	**.76****
6. Members of my club appeared to be diligent in pursuing their goals (GP)	.05	**.82****

Note. GI = goal interest, GP = goal perseverance. Bold text indicates grouping of items.
*p < .05, **p < .001.

2.3.2 Descriptive Analyses

Means, standard deviations, bivariate correlations, scale internal consistency, and intraclass correlation coefficients (ICC [1]) for variables are reported in Table 4. All scale-scored constructs demonstrated moderate internal consistency, ranging from .50 (SR goal interest) to .75 (GR goal perseverance).

Table 4 Descriptive statistics, bivariate correlations, and intraclass correlations[1].

Variable	1	2	3	4	5	6	7	8
1.Gender (1 = M, 2 = F)	-							
2. Age	.08	-						
3. SR Goal Interest	.04	-.18*	(.00)					
4. SR Goal Perseverance	-.13	-.19*	.31**	(.13)				
5. GR Goal Interest	.01	.00	.27**	.01	(.00)			
6. GR Goal Perseverance	-.04	.04	-.07	.22**	-.07	(.04)		
7. Interdependence	.10	-.02	-.12	.24**	-.10	.17*	(.01)	
8. Conscientiousness	-.09	-.05	.40**	.54**	.12	.16*	.18*	(.00)
M	-	20.05	3.31	3.58	3.22	3.67	4.62	3.44
SD	-	2.21	0.65	0.67	0.59	0.66	0.89	0.62
Internal consistency (α)	-	-	.50	.64	.57	.75	.51	.71

Note. SR = self-referent, GR = group-referent. *$p < .05$, **$p < .001$.
[1]ICC (1) values are evident on the diagonal of this table.

Variables demonstrated low to moderate ICC values, which indicates participants had relatively low shared variance when estimated at the group level. To assess the assumption that data were missing completely at random (MCAR), I ran Little's MCAR test (Little, 1988) on raw data including scale-scored variables. The test for all continuous variables was not statistically significant ($p = .23$) therefore data appeared to be MCAR. An examination of variable skewness suggests most individual predictors fall within a normal distribution range with values ranging from -0.50 to 0.50. However, GR goal perseverance exhibited negative skewness with a value of -0.75 ($SE = 0.18$). Scatter plots of regression slope residuals against estimated values for SR goal interest and SR goal perseverance were examined for information on normality, linearity, and heteroscedasticity (Hox et al., 2018).

Bivariate correlations were examined to initially assess the relationships between variables. Notably, SR goal interest and SR goal perseverance both exhibited moderate positive correlations with conscientiousness ($r = .40$, $p < .001$ and $r = .53$, $p < .001$

respectively). Perceived task interdependence was positively correlated with SR and GR goal perseverance but was not significantly correlated with SR or GR goal interest.

2.3.3 Regression and Moderation

Results for SR goal interest models are shown in Table 5 and results for SR goal perseverance models are shown in Table 6. Model fit improved across models as demonstrated through decreasing Loglikelihood values. One exception to the improvements in model fit was for goal perseverance, in the step from Model 2 to Model 2a where the Loglikelihood remained constant (i.e., the step introducing interaction terms for the moderation). Both sets of models demonstrated SR grit was associated with the GR grit score in the same dimension. Significant moderations were identified in SR Model 2a. Note that three-way interactions were tested for both model sets (i.e., interdependence interacting with both GR goal interest and GR goal perseverance) and these were not significant, so models with only two-way interactions were used for parsimony.

Hypothesis 1 addressed the relationship between SR goal interest and GR goal interest and perseverance. Accounting for relevant control variables (e.g., gender, age) and partialing-out variance due to conscientiousness ($\beta = 0.43$, $p < .001$) in Table 5 Model 2, results show GR goal interest is a significant predictor of SR goal interest ($\beta = 0.11$, $p = .04$). GR goal perseverance was not significantly associated with SR goal interest. Regarding moderating effects of interdependence on the relationship between SR goal interest and GR grit subscales, interaction terms are identified in Table 5 Model 2a. Both the interaction between interdependence and GR goal interest ($\beta = 0.15$, $p < .001$) as well as the interaction between interdependence and GR goal perseverance ($\beta = 0.13$, $p = .02$) were significant. This signals that the effect of grit we perceive among group members when predicting our SR goal interest depended on perceived interdependence and provides support for Hypothesis 2.

Table 5 Multilevel models predicting self-referent goal interest.

	Goal Interest β (SE)		
	Model 1 Null Model	Model 2 Primary predictors	Model 2a Interdependence Moderation
Random Effects			
Intercept	7.48 (1.05)	4.95 (0.26)	4.99 (0.30)
Fixed Effects			
Gender	0.07 (0.06)	0.15 (0.04)**	0.12 (0.03)**
Age	-0.20 (0.09)*	-0.20 (0.04)**	-0.21 (0.05)**
Conscientiousness	-	0.43 (0.05)**	0.43 (0.05)**
GR Goal Interest	-	0.11 (0.06)*	0.10 (0.04)**
GR Goal Perseverance	-	-0.08 (0.06)	-0.06 (0.07)
Interdependence	-	-0.14 (0.08)	-0.17 (0.06)**
GR Goal Interest X Interdependence	-	-	0.15 (0.05)**
GR Goal Perseverance X Interdependence	-	-	0.13 (0.06)*
Model Fit (Loglikelihood)	-148.50	-120.85	-117.03
R^2	0.04 (0.04)	0.26 (0.04)**	0.30 (0.05)**

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. *$p < .05$, **$p < .001$.

My subsequent step was to decompose the effects of GR goal interest and perseverance on SR goal interest, at relatively low, moderate, and high levels of the moderator. First, regarding the interaction of interdependence and GR goal interest (see Figure 2) there was a significant positive association between GR goal interest and SR goal interest at the mean for interdependence, ($b = 0.11$, *95% CI* [0.04, 0.19]) and at high levels of interdependence, ($b = 0.28$), *95% CI* [0.15, 0.41]). However, at low levels of interdependence, there was no significant relationship between GR goal interest and SR goal interest, ($b = -0.05$, *95% CI* [-0.16, 0.06]). When comparing the simple slopes relative to one another, it was evident that the effect of GR goal interest was stronger for those at +1SD of interdependence, relative to those at low levels of interdependence. In sum, the effect of GR goal interest on SR goal interest was stronger for those perceiving the greatest interdependence with other club members relative to those perceiving low interdependence.
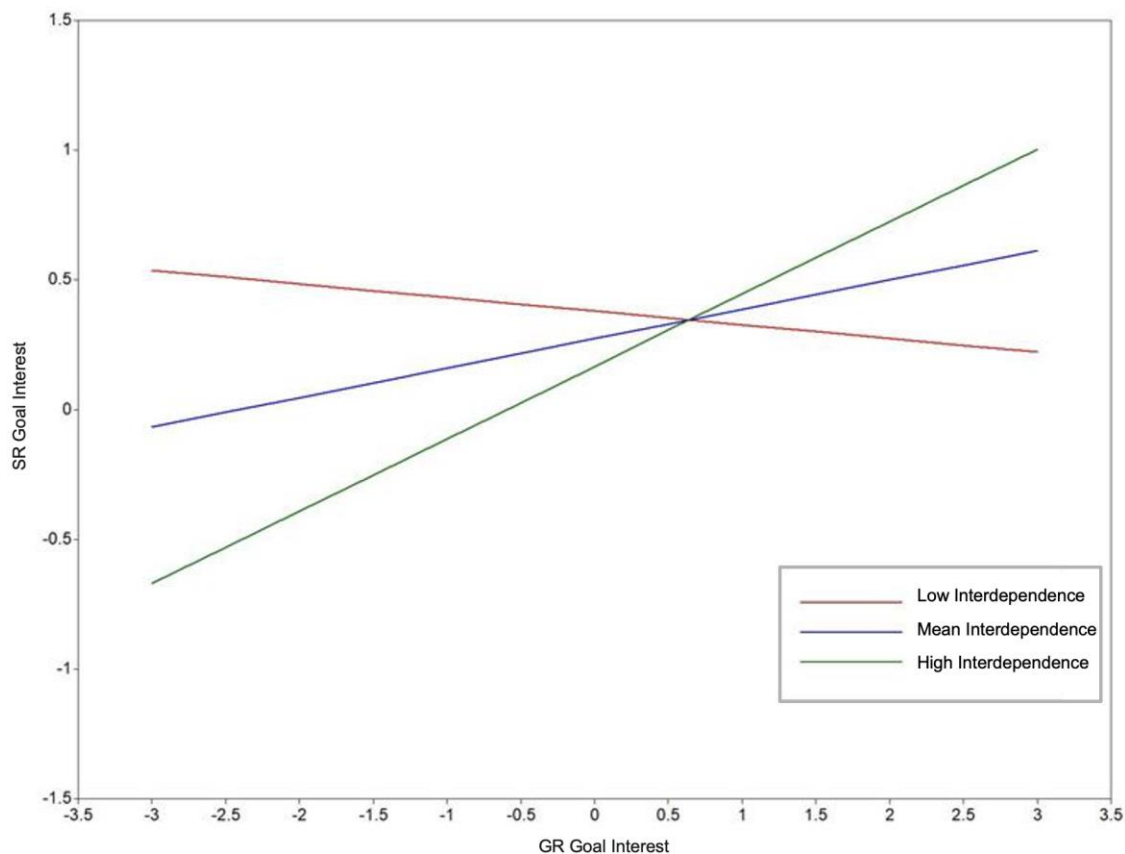
Figure 2 Interaction effect between interdependence and group-referent goal interest on self-referent goal interest.

Note. All variables are grand mean centered.

The other significant interaction term included the same dependent variable and moderator, but instead considered GR goal perseverance as the predictor (see Figure 3). There was a significant negative association between SR goal interest and GR goal perseverance at low levels of interdependence, (b = -0.19, *95% CI* [-0.34, -0.05]). There was not a significant association between SR goal interest and GR goal perseverance at the mean for interdependence, (b = -0.06, *95% CI* [-0.18, 0.07]) nor at high levels of interdependence, (b = 0.08, *95% CI* [-0.11, 0.27]). Comparing the simple slopes, the effect of GR goal perseverance on SR goal interest significantly differed at low levels of the moderator relative to those at high levels. When participants reported lower perceived club interdependence, GR goal perseverance was negatively associated with SR goal interest.
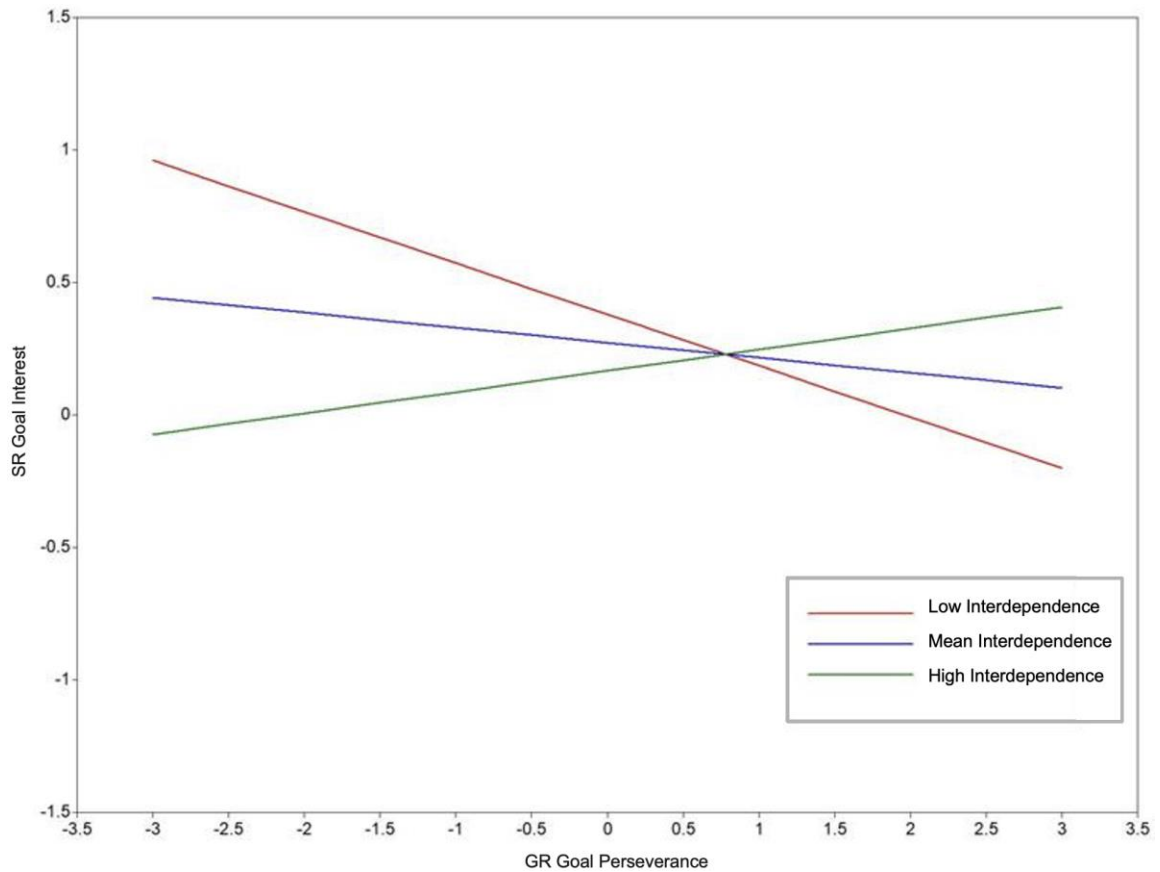
Figure 3 Interaction effect between interdependence and group-referent goal perseverance on self-referent goal interest.

Note. All variables are grand mean centered.

Considering models with SR goal perseverance as the dependent variable neither GR goal interest nor GR goal perseverance were significant predictors. Conscientiousness was significantly associated with SR goal perseverance ($\beta = 0.48$, $p < .001$), as was interdependence ($\beta = 0.14$, $p = .04$). Interaction terms were not significant when exploring potential moderation of interdependence on the relationship between GR goal interest and perseverance and SR goal perseverance.

Table 6 Multilevel models predicting self-referent goal perseverance.

	Goal Perseverance β (SE)		
	Model 1 Null Model	Model 2 Primary predictors	Model 2a Interdependence Moderation
Random Effects			
Intercept	7.32 (0.97)	5.34 (0.26)	5.34 (0.26)
Fixed Effects			
Gender	-0.10 (0.06)	-0.07 (0.05)	-0.07 (0.05)
Age	-0.15 (0.08)	-0.16 (0.08)*	-0.15 (0.07)*
Conscientiousness	-	0.48 (0.06)**	0.48 (0.06)**
GR Goal Interest	-	0.02 (0.04)	0.02 (0.04)
GR Goal Perseverance	-	0.15 (0.09)	0.15 (0.09)
Interdependence	-	0.14 (0.07)*	0.14 (0.07)*
GR Goal Interest X Interdependence	-	-	-0.01 (0.04)
GR Goal Perseverance X Interdependence	-	-	-0.02 (0.04)
Model Fit (Loglikelihood)	-157.94	-123.96	-123.92
R^2		0.37 (0.05)**	0.37 (0.05)**

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. *$p < .05$, **$p < .001$.

2.4   Study 1 Discussion

Recall that I expected grit relating to one's-own goals within the group would be related to student club members' perceptions of their clubmates grit. Considering SR goal interest – perceptions about one's own recent interest in group related goals – GR goal interest had a significant positive association. GR goal perseverance, by contrast, did not predict SR goal interest. As for SR goal perseverance, neither GR goal interest nor GR goal perseverance demonstrated a significant association. Results provide partial support for Hypothesis 1, as perceptions of club members' grit on one dimension of the measure predicted self-referent perceptions of weekly goal interest.

My second hypothesis outlined how I expected perceived task interdependence would moderate relationships between SR and GR grit. First in relation to SR goal interest as the outcome variable, significant interaction terms were identified with interdependence and

both GR goal interest and GR goal perseverance. Further analysis suggested there was a significant association between SR goal interest and GR goal interest only at mean and high levels of interdependence. In contrast, there was a significant negative association between SR goal interest and GR goal perseverance at low levels of interdependence. There were no moderation effects of interdependence in the relationships between SR goal perseverance and GR grit dimensions. These findings provide partial support for Hypothesis 2.

Key considerations in these analyses include the cross-sectional nature of the study design, as well as the context selected for participants. Pertaining to the cross-sectional nature of the present study, I am neither able to demonstrate a causal direction of the link between group- and self-referent grit, nor am I able to fully account for the dispositional characteristics that are likely to contribute to perceptions of both GR and SR grit. Pertaining to the context, one strength of this study is the fact that it was a field study conducted with naturalistic team environments necessary for studying my proposed associations. Still, clubs represent only one of many potential groups or goals that members perform and there was substantial heterogeneity in the extent to which club members were required to work interdependently toward individual or group goals.

One limitation embedded in the current study design is the relative heterogeneity in the types of groups sampled. There was variability across various defining factors of groups (e.g., club size, nature of group task, frequency of club interactions) which should be considered in the interpretation of study findings. Collecting participant data from a variety of clubs can produce a more naturalistic sample and introduce variability in key constructs that can support meaningful analyses. Still, variability can produce other key challenges with analysis and interpretation. Perhaps the most notable area of variability was in the nature of team and individual goals. Whereas many clubs had very clear and unambiguous individual goal pursuits (e.g., sport clubs), other clubs involved tasks where individual pursuits are less distinguishable from group tasks (e.g., subgroup fundraising goals).

Chapter 3

3 Study 2

Study 2 was designed to build upon the findings from Study 1, by targeting individual variability in grit perceptions and by focusing on a context with heightened goal salience. Regarding individual variability, this investigation sought to move from a focus on predicting who will have relatively higher or lower grit perceptions relative to others, toward examining when individuals' grit perceptions will be relatively higher or lower than their average. In other words, Study 2 adopted an intensive longitudinal design that can provide a highly sensitive test of associations between key variables.

Empirical studies on close relationships and goal pursuit in group contexts provide examples for how transactive goal dynamics can be examined at a weekly or momentary level. Hofmann and colleagues (2015) employed an intensive longitudinal research design to study the effect of daily fluctuations in state relationship satisfaction on goal pursuit behaviors in dyadic relationships. Results found a positive association between state relationship satisfaction and goal performance, providing support for the value of measurement-intensive designs for understanding changes in goal pursuit over time. Reynolds and colleagues (2019) investigated the impact of observing group members' goal pursuit towards a shared exercise goal in a weight loss group program. Findings suggested when others in the program made progress toward shared goals, participants experienced increased intentions to pursue the shared goal and perceptions of their own goal progress whether or not they had made objective gains toward goals.

Particularly because our experiences within groups unfold over a span of time, intensive designs focusing on within-person variability provide both a way to: (a) factor-out between-person sources of error, and (b) focus on a unique type of association relative to between-person effects. Germane to the current study is a methodological assumption that within-person approaches are powerful tools to explore social influences on goal pursuit. Specifically, assessing goal pursuit via a weekly diary design in which each participant acts as their own control permits analyses to parse the effects of weekly

variation as opposed to differences experienced by people with different levels of dispositional grit.

Regarding context, I selected a sample of competitive rowers, training in a goal-oriented and competitive club environment. Selecting a near-elite sample, I explored the relationship between variables in a context where participants are pursuing similar goals, with a high degree of significance. A within-person design was especially valued in this context as competitive athletes may demonstrate unique levels of disposition conscientiousness and grit, making it valuable to examine how context-specific goal interest and perseverance may still fluctuate despite lower sample variability in trait variables. The club sample in Study 1 consisted of a heterogenous array of group types, aims, and outcomes and so measuring outcome interdependence did not theoretically align with realities of the sample. However, the rowing club environment can be influential when considering both task interdependence (e.g., rowing within same boat, collaborating during training sessions; Kellmann et al., 2006) and outcome interdependence (e.g., sharing team outcomes; Evans et al., 2015) therefore, both were measured as potential moderators in the current study.

As in Study 1, I aimed to unpack the underlying factor structure of self- and group-referent measures of grit and assess the scale characteristics of context-specific goal interest and perseverance. Building from Study 1 findings, I developed directional hypotheses for relationships of interest in an intensive longitudinal design, anticipating variables' within-person weekly fluctuations would reflect similar associations to those found in between-person results.

> **H1:** *Weekly fluctuations in self-referent goal interest/perseverance scores will be positively related to weekly fluctuations in group-referent goal interest/perseverance scores.*

As in Study 1, I hypothesized that perceptions of interdependence in the group context would moderate the relationships in my first hypothesis. In this case, however, I once again focus on weekly changes in interdependence perceptions as the moderator as

opposed to static interdependence perceptions. Integrating moderation results from Study 1, I hypothesized that:

> **H2:** *Interdependence would moderate the association between self-referent and group-referent grit. During weeks in which participants reported higher interdependence in the training context relative to their weekly average, closer associations would be observed between weekly self-referent goal interest/perseverance and group-referent goal interest/perseverance.*

The rowing context provided an opportunity to evaluate a further, and more descriptive, research question focused on weekly training contexts. This question aimed to explore the extent to which contextual features (e.g., perceptions of training compared to typical weeks, time spent with teammates) relate to weekly variance in SR goal interest and perseverance. I also proposed an additional exploratory question relating to individual experiences relevant in a sport context including positive affect and perceptions of goal-related outcomes. This question focused on how SR grit, GR grit, and relevant contextual variables are associated with these sport-relevant outcomes. These were both descriptive, exploratory aims.

3.1   Study 2 Methods

3.1.1 Participants

Participants were Canadian and American rowers competing as club members at national and international levels in 'Senior' (i.e., over 18 years of age, competitive) and 'Masters' (i.e., above 35 years of age, competitive) rowing. Participants primarily identified as competing in women's rowing (75%) and reported rowing competitively for an average of 4.65 years ($SD = 1.04$). Participant age ranged from age 19 to 66 years old ($M = 28.05$ years, $SD = 14.81$), although most participants (73%) were young adults between 19 and 30 years of age.

Surveys were completed amidst training during the early Spring season, which was characterized primarily by off-water training; some participants transitioned to on-water training during the period when surveys were completed. All participants were recruited

through their club or team and reported training alongside other teammates for approximately 75% of their training sessions. This pattern confirms the club-based nature of training activities.

3.1.2 Procedure

The present study involved recruitment through ads shared with rowing clubs and teams. Coaches and managers from rowing clubs across Canada were e-mailed and asked to forward information regarding the study, as well as a link to the survey materials, to their athletes. Participants who read the invitation selected a link to complete an initial online survey. This online survey was conducted as part of a larger, cross-sectional survey. However, participants were given the option to voluntarily indicate whether they would be interested in participating in a follow-up study over the course of eight weeks; this was the focus of the present study. From the 84 rowers who completed the larger-scale cross-sectional survey, 26% volunteered to complete the present weekly diary survey.

Study participants received all weekly surveys through email and completed the surveys on their own devices. Athletes were sent eight surveys, which were distributed on a day of the week requested by athletes. If participants did not complete the survey within 48 hours of receiving an email invitation, they were prompted with a second email reminder to complete the survey. All weekly surveys included key variables regarding weekly training environments as well as individuals' self-reported and perceived teammate grit. Demographic variables were gathered during the pre-survey, and the eighth (final) survey also included a measure of trait grit.

Compensation is an important component of intensive longitudinal studies. I included a compensation pattern extending across all surveys. Participants received a $5 gift card immediately after completing the first survey. Participants then received $2 per weekly survey, sent as a lump sum gift card at the end of the eighth weekly survey. Most participants (64%) received $20.00 in total.

3.1.3 Measures

As in Study 1, weekly surveys contained measures of grit with individual and group referents and interdependence perceptions with the addition of training context perceptions, sport-relevant outcome perceptions, and the final survey measured dispositional grit. Internal consistency for scale-scored variables included in primary regressions (i.e., Chronbach's α) are available within Table 9.

3.1.3.1   Demographics

In the first weekly survey, participants were asked whether they compete in women's or men's rowing. Other demographic data (e.g., age, years rowing, level of experience) was collected in the larger cross-sectional survey which the current sample was from and randomly generated numeric identifiers were used to match up demographic data from the previous survey with participants of the current study.

3.1.3.2   Weekly Rowing-related Goal Interest and Perseverance (Grit) with Individual and Group Referents

Study 2 leveraged the same six items that were previously adapted for Study 1 from the Short Grit Scale (Duckworth & Quinn, 2009). All items were measured on a 5-point Likert scale (1 = *not at all like me*, 5 = *very much like me*). Similar to adapted items in Study 1, SR items asked participants to rate their rowing-related goal interest and goal perseverance thinking about their past week of training. All group-referent items were adapted to ask about perceptions of teammate grit, using one's team as the referent. Each group-referent grit item started with the stem "*This week in rowing training and competition, my teammates appeared to…*".

3.1.3.3   Perceived Task and Outcome Interdependence

Two items were used to measure task interdependence and outcome interdependence respectively, based on prior research involving interdependence in sport teams (Evans et al., 2015). Although originally developed from Van der Vegt and Janssen's (2003) measure used in Study 1, the two items selected were adapted to more broadly capture both facets of interdependence in a sport context. Items were measured on a 5-point

Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*) involving the extent to which over the past week participants *"depended on teammates to perform well"* (task interdependence) and *"shared a collective goal with teammates"* (outcome interdependence).

3.1.3.4   Positive Affect

Guided by similar intensive longitudinal research examining weekly fluctuations in state-level positive affect (Jiang et al., 2020), five items measured weekly positive affect. Items asked participants the extent to which they felt enthusiastic, interested, determined, alert, and active over the past week and were measured on a 5-point Likert scale (1 = *very slightly or not at all*, 5 = *extremely*).

3.1.3.5   Weekly Training Context

Items examining the training context included one open-ended item encouraging participants to identify any recent or upcoming competitions. Three items were developed to measure variability in training intensity, volume, and relative enjoyment of training during a given week; these were measured on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*).

3.1.3.6   Weekly Training with Teammates

One item asked about the estimated percentage of participant's training and competition during the week that was done in the presence of teammates or with club members nearby.

3.1.3.7   Weekly Individual Rowing Achievement

Two items adapted from Frey et al. (2003) asked participants to report perceptions of their weekly rowing achievement. The first item (*"my performance this week, compared to how I expected to perform was"*) addressed performance achievement and the second item (*"my achievement of training goals was"*) measured perceived goal achievement. Both items were measured on a 5-point Likert scale (1 = *poor*, 5 = *strong*).

3.1.3.8   Trait Grit

In addition to the adapted weekly grit items described above, all participants completed the 8-item Short Grit Scale (Duckworth & Quinn, 2009) at the conclusion of the study.

3.2   Study 2 Analyses

Data had a two-level structure wherein weekly survey data was nested within individuals. This means that an initial step involved preparing data in a 'long' format (i.e., each weekly response being an individual row in the data, linked via participant codes). Subsequent steps involved evaluating response patterns and calculating key variables (e.g., person-mean variables). Additionally, I evaluated variables in relation to relevant assumptions. For instance, I assessed the distributions of variables (i.e., ceiling effects and normality via skew) and assessed multicollinearity for all key variables.

I replicated factor analyses from Study 1 to examine SR and GR grit scales. As in Study 1, type = complex in Mplus was used which is a Level-1 model that uses Huber-White estimation to account for the clustering of data (Maas & Hox, 2004). The current sample had more Level 2 units than the sample for Study 1 although this sample still contained fewer clusters than is typically recommended for this type of analysis (Huang, 2018). Therefore, there are limitations in the interpretation of these factor analyses.

When testing my primary research question (H1), full multilevel linear models were used to distinguish variance at the weekly within-person level from variability that is stable at a between-person level. All analyses were conducted using Mplus 8.9 and used full information maximum likelihood to estimate parameters. All models also featured random intercepts but held effect slopes constant. Preliminary models involved estimating intraclass correlation coefficients (ICC [1]) to indicate the proportion of variance attributed to the person-level of analyses. ICCs were calculated for all variables through unconditional (null) multilevel models (Raudenbush & Bryk, 2002), which both provided descriptive value while also informing the multilevel analysis strategy. As anticipated, when responses are nested within the same individuals over time, shared variance within individuals' responses was moderate for most variables and confirmed the value of multilevel analyses.

My first models examined the amount of variance in SR goal interest and perseverance explained by GR goal interest and perseverance, while accounting for relevant control variables. As a within-person control variable, I included the week from which a response was collected (i.e., 1 to 8) to account for plausible ordering effects in responses. Then to explore the potential moderating effects of interdependence, interaction terms were added to examine both task and outcome interdependence in relationships between GR and SR grit in the final models.

Examining my third research question, subsequent regression models included context variables (e.g., perceived intensity, volume, and fun of weekly training and percent of weekly training done around teammates) as predictors of weekly SR goal interest and goal perseverance while controlling for between-person trait grit to account for additional variance. Finally, separate regression models were run to examine potential associations between relevant outcome variables (e.g., positive affect, self-reported weekly achievement) and SR grit as well as perceptions of teammates and the team environment.

I used person-mean centering for multilevel analyses. For scale-scored predictor variables, I computed person-mean variables that were centered around the grand-mean (between person predictors) along with person-mean centered values (within person predictors). Such an approach is pertinent within intensive longitudinal models in which the focus is on deviation from one's typical perceptions or ratings. All models also used standardized coefficients when interpreting effects, to overcome the different scales across predictor variables (Enders & Tofighi, 2007).

3.3   Study 2 Results

3.3.1 Factor Analysis

Confirmatory factor analysis and exploratory structural equation models signaled acceptable fit of the adapted-weekly SR grit scale. Compared to a one-factor model, relative fit improved in a two-factor model suggesting grit is best conceptualized as two separate subscales (i.e., goal interest and goal perseverance) rather than a single dimension. When evaluating the goal-relevant GR grit measure, fit indices of a one-factor model were not appreciably different from those of the two-factor model. Fit statistics for

all models are reported in Table 7. My analyses considered SR and GR grit across the two facets of goal interest and goal perseverance. For the final model, I opted for a two-factor CFA and loadings for self- and group-referent scales are presented in Table 8.

Table 7 Scale testing fit statistics.

	SR Grit Scale			GR Grit Scale		
Study 2 Models	RMSEA	CFI	SRMR	RMSEA	CFI	SRMR
One-factor ESEM	.04	.97	.05	.00	1.00	.03
One-factor CFA	.04	.97	.05	.00	1.00	.03
Two-factor ESEM	.10	.92	.03	.00	1.00	.01
Two-factor CFA	**.02**	**.99**	**.04**	**.00**	**1.00**	**.02**

Note. SR = self-referent, GR = group referent. Bolded values indicate final scale model.

Table 8 CFA loadings for self- and group-referent grit.

Self-referent items	Goal Interest	Goal Perseverance
1. I set goals at the start of the week but ended up pursuing different ones	.53**	
2. I had difficulty maintaining focus on my goals	.67**	
3. I gave up on some of my plans for rowing this week	.38*	
4. I worked exceptionally hard in pursuing my goals		.48**
5. I finished whatever I began		.79**
6. I was not discouraged by setbacks		.48**
Group-referent items		
1. My teammates appeared to set goals at the start of the week but end up pursuing different ones	.49**	
2. My teammates appeared to have difficulty maintaining focus on their goals	.79**	
3. My teammates appeared to give up on some of their plans for rowing this week	.21	
4. My teammates appeared to work exceptionally hard in pursuing their goals		.64**
5. My teammates appeared to finish whatever they began		.78**
6. My teammates appeared to not be discouraged by setbacks		.48**

Note. *p* < .05, **p* < .001.

3.3.2 Descriptive Analyses

Means, standard deviations, correlations, scale internal consistency, and intraclass coefficients (ICC) for variables are reported in Table 9. Examining bivariate correlations, weekly SR goal interest had significant positive correlations with weekly perceptions of training intensity ($r = .27$, $p < .001$), volume ($r = .27$, $p < .001$), and fun ($r = .47$, $p < .001$). SR goal perseverance also had positive correlations with weekly training intensity ($r = .45$, $p < .001$), volume ($r = .31$, $p < .001$), and fun ($r = .39$, $p < .001$) in addition to exhibiting a significant positive correlation with time training with teammates ($r = .27$, $p < .001$). Weekly variability in SR goal perseverance also exhibited small but significant positive correlations with outcome interdependence ($r = .23$, $p < .001$) and task interdependence ($r = .23$, $p < .001$). As one further descriptive characteristic, generally, participants viewed their group environments as possessing moderate, but varying, levels of task and outcome interdependence.

Nearly all skewness statistics suggested distributions ranging from normal distribution to slightly skewed (i.e., range from -1.47 to 1.79). Relative to common self-report scales that often involve ceiling effects and skew, all central variables demonstrated distributions appropriate for parametric analyses. Reflecting on the ICCs, a proportion of variance in key variables was attributed to the between-person level. This indicates a relatively low to moderate proportion of variance being explained by the clustering structure (Hox et al., 2018), which is often expected for intensive longitudinal designs where responses are nested within individuals.

As a further exploratory step to describe response patterns in the dependent variables, Figure 4 illustrates participants' weekly variability in SR goal interest and SR goal perseverance values, using simplified person-specific plots of responses across eight response time points. Weekly SR goal interest and perseverance plots are provided for 13 participants who completed all eight survey responses. These graphs aid in visualizing how context-specific goal interest and perseverance vary across different weeks in a group setting. Whereas participants did not visually demonstrate given trends (e.g., increase or decrease), these graphs do illustrate variability within and across grit dimensions.

Table 9 Descriptive statistics, bivariate correlations, and intraclass correlations[1].

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender (1= F, 2 = M)	-											
2. Age	.12	-										
3. SR Goal Interest	-.01	-.12	(.17)									
4. SR Goal Perseverance	-.08	-.15	.45**	(.27)								
5. GR Teammate Goal Interest	-.12	-.11	.48**	.15	(.17)							
6. GR Teammate Goal Perseverance	-.14	-.11	.23**	.36**	.44**	(.12)						
7. Training (Intensity)	.14	-.02	.27**	.45**	.13	.20*	(.11)					
8. Training (Volume)	.14	.05	.27**	.31**	.21**	.12	.62**	(.01)				
9. Training (Fun)	-.17*	-.19	.47**	.39**	.25**	.18*	.33**	.39**	(.18)			
10. Training (with Teammates)	-.02	-.04	.16	.27**	.15	.25**	.21*	.27**	.20*	(.25)		
11. Outcome Interdependence	.06	.17*	.10	.23**	.10	.19*	.27**	.27**	.23**	.38**	(.19)	
12. Task Interdependence	.03	-.11	.03	.23**	.03	.09	.32**	.26**	.23**	.52**	.46**	(.16)
M	-	27.67	3.30	3.59	3.36	3.84	3.04	2.83	3.58	75.64	3.63	3.30
SD	-	14.19	0.73	0.71	0.55	0.57	1.23	1.21	0.96	30.70	1.13	1.24
Internal consistency (α)	-	-	.53	.59	.46	.65	-	-	-	-	-	-

Note. SR = self-referent, GR = group-referent. Variables 3-9 were all Likert-type measures that ranged from 1-5, whereas variable 10 ranged from 1-100. *p < .05, **p < .001.
[1]ICC (1) values are evident on the diagonal of this table
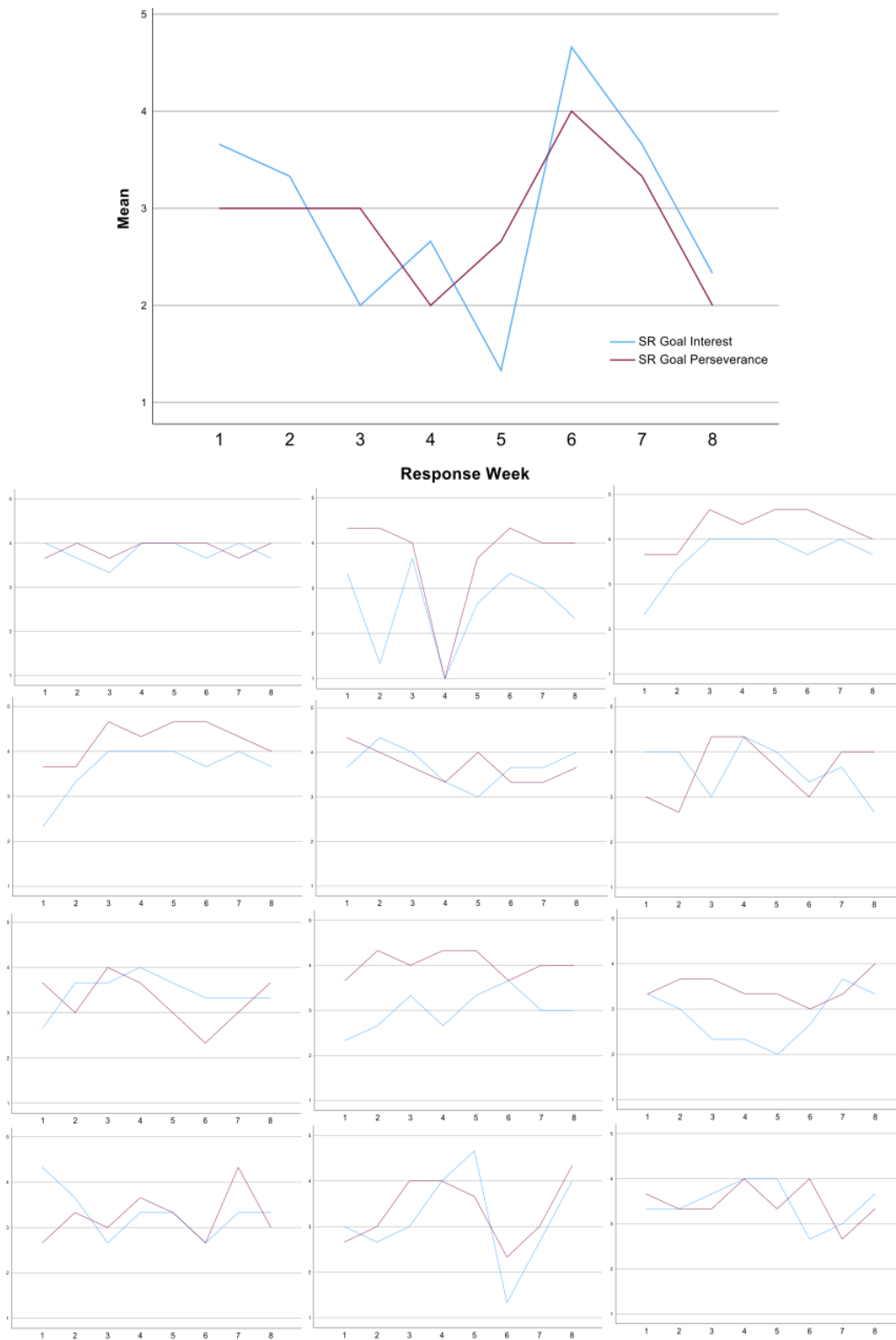
Figure 4 Plots of within-person SR goal interest and goal perseverance over time.

Note. Illustrated are person-specific responses on self-referent goal interest and goal perseverance, as raw values, at each week during the survey completion process. The

largest figure provides the complete axes and legend descriptors for one participant. Remaining 12 graphs adopt the same scheme, but with smaller and simplified illustrations (9 individual graphs are not featured here).

3.3.3 Regression and Moderation

Results from SR goal interest models are shown in Table 10 and results from SR goal perseverance models are shown in Table 11. Note that model fit improved across each successive step from the initial models with no contextual covariates to models including contextual covariates, illustrated through reductions in the Loglikelihood values across models. Recall that I anticipated GR grit would predict SR grit, alongside other key contextual variables, and that I tested this pattern separately for SR goal interest (Table 10 Models 2 a/b) and SR goal perseverance (Table 11 Models 2 a/b).

Accounting for response week as a control variable, both GR goal interest ($\beta = 0.34$, $p < .001$) and GR goal perseverance ($\beta = 0.17$, $p = .03$) were significant predictors of SR goal interest at the within-person level. Outcome interdependence was also found to have a significant association with SR goal interest ($\beta = 0.17$, $p = .04$). At the between-person level, GR goal interest was found to have a significant positive relationship with SR goal interest ($\beta = 0.71$, $p < .001$). However, the number of Level 2 units is relatively low to draw conclusions at the between-person level. The next step was further exploring the effects of GR grit dimensions and both types of interdependence on SR goal interest. Only one significant interaction term was found with GR goal interest and task interdependence. Probing task interdependence moderation effects (Figure 5), there was a significant association between GR goal interest and SR goal interest at mean task interdependence, ($b = 0.51$, *95% CI* [0.29, 0.73]) and high levels of task interdependence ($b = 0.83$, *95% CI* [0.46, 1.21]). There was no significant association between GR goal interest and SR goal interest at low levels of task interdependence, ($b = 0.19$, *95% CI* [-0.13, 0.51]). Simple slope confidence intervals indicate associations at high and low levels of task interdependence are statistically different from one another. Neither interaction term for outcome interdependence moderation was significant suggesting the association between GR grit and SR goal interest does not differ across low, moderate, and high levels of outcome interdependence.

Table 10 Multilevel models predicting self-referent goal interest.

| | SR Goal Interest | | |
| | β (SE) | | |
	Model 1 Null Model	Model 2 Primary predictors	Model 2a Task Inter. Moderation	Model 2b Outcome Inter. Moderation
Random Effects				
Intercept	10.90 (2.54)	10.02 (2.21)	10.49 (2.38)	9.84 (2.16)
Fixed Effects				
Within Level				
Response Week (1-8)	-	0.09 (0.07)	0.08 (0.07)	0.09 (0.07)
GR Goal Interest (CWP)	-	0.34 (0.08)**	0.37 (0.08)**	0.34 (0.08)**
GR Goal Perseverance (CWP)	-	0.17 (0.08)*	0.16 (0.08)*	0.18 (0.08)*
Outcome Inter. (CWP)	-	0.17 (0.08)*	0.18 (0.08)*	0.19 (0.08)*
Task Inter. (CWP)	-	-0.11 (0.09)	-0.13 (0.08)	-0.12 (0.09)
GR Goal Interest X Outcome Inter.	-	-	-	0.11 (0.10)
GR Goal Perseverance X Outcome Inter.	-	-	-	-0.07 (0.10)
GR Goal Interest X Task Inter.	-	-	0.19 (0.08)*	-
GR Goal Perseverance X Task Inter.	-	-	-0.11 (0.09)	-
Between Level				
GR Goal Interest (PM)	-	0.71 (0.19)**	0.72 (0.19)**	0.72 (0.19)**
GR Goal Perseverance (PM)	-	-0.43 (0.25)	-0.42 (0.26)	-0.43 (0.25)
Outcome Inter. (PM)	-	-0.02 (0.26)	-0.04 (0.27)	-0.00 (0.26)
Task Inter. (PM)	-	-0.12 (0.24)	-0.10 (0.24)	-0.14 (0.24)
ICC	.17	.19	.18	.20
Model Fit (Loglikelihood)	-165.95	-137.95	-135.25	-137.33
R^2 Within Level	-	0.25 (0.06)**	0.28 (0.06)**	0.26 (0.06)**
R^2 Between Level	-	0.51 (0.23)*	0.52 (0.23)*	0.51 (0.22)*

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. CWP = Centered within person; PM = Person-mean centered at the grand mean. *p < .05, **p < .001.
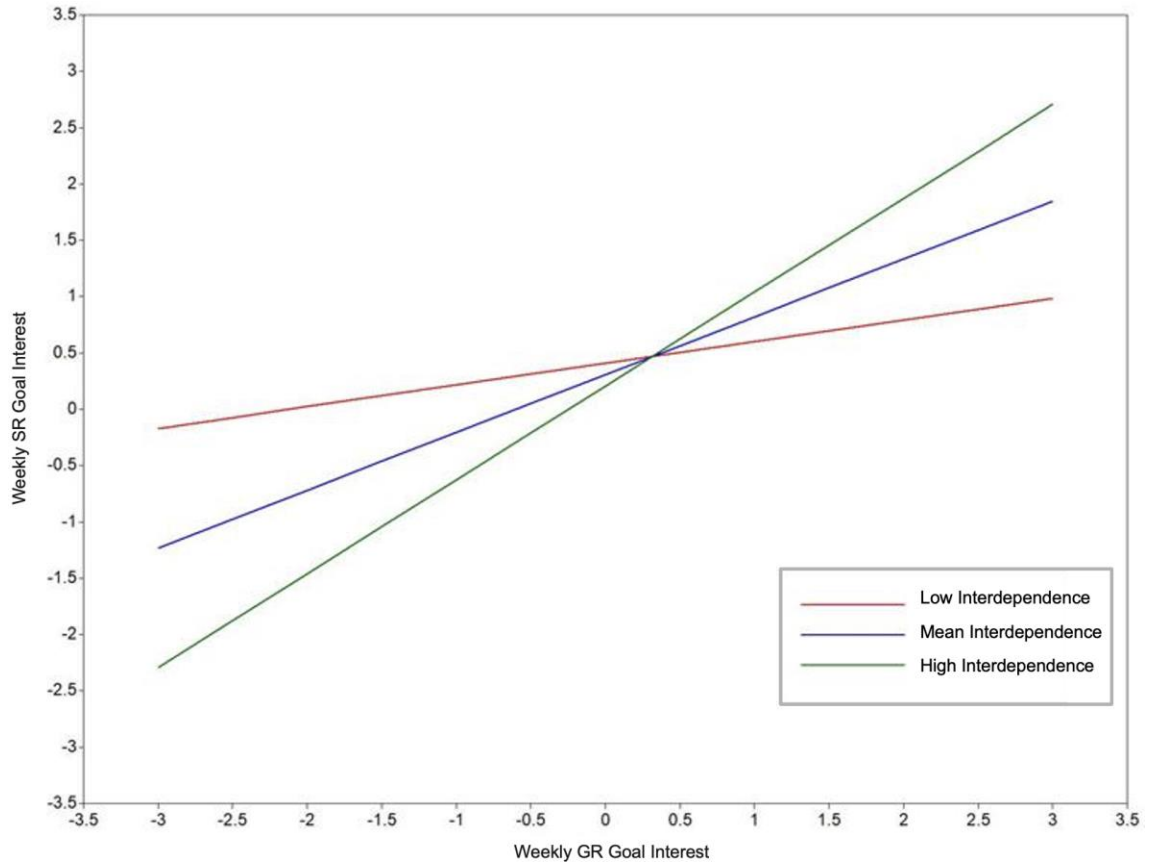
Figure 5 Interaction effect between task interdependence and group-referent goal interest on self-referent goal interest.

Note. All variables are grand, and person mean centered.

At the within-person level, only GR goal perseverance ($\beta = 0.38$, $p < .001$) was a significant predictor of SR goal perseverance and no variables at the between-person level emerged as significant. Examining potential task interdependence moderation in the relationship between GR grit and SR goal perseverance, neither interaction term was significant. A significant interaction term for outcome interdependence and GR goal interest led me to further probe the effects of GR goal interest on SR goal perseverance at low, moderate, and high levels of the moderator (Figure 6). Examining moderation slopes, there was no significant association between GR goal interest and SR goal perseverance at high levels of outcome interdependence, ($b = 0.29$, *95% CI* [-0.05, 0.63]), mean levels of interdependence, ($b = 0.00$, *95% CI* [-0.20, 0.20]), or low levels of interdependence, ($b = -0.29$, *95% CI* [-0.63, 0.05]). Although, at low and high levels of outcome interdependence, the slopes are close to being small but significant.

Additionally, confidence intervals of slopes at high and low levels of the moderator suggest the associations are different from each other and the current sample may be too small to detect the interaction.

Table 11 Multilevel models predicting self-referent goal perseverance.

	SR Goal Perseverance β (SE)			
	Model 1 Null Model	Model 2 Primary predictors	Model 2a Task Inter. Moderation	Model 2b Outcome Inter. Moderation
Random Effects				
Intercept	9.67 (2.05)	9.39 (1.84)	9.34 (1.83)	9.63 (1.89)
Fixed Effects				
Within Level				
Response Week (1-8)	-	0.02 (0.08)	0.02 (0.08)	0.01 (0.07)
GR Goal Interest (CWP)	-	0.00 (0.08)	0.01 (0.08)	0.00 (0.08)
GR Goal Perseverance (CWP)	-	0.39 (0.08)**	0.38 (0.08)**	0.41 (0.08)**
Outcome Inter. (CWP)	-	0.09 (0.08)	0.10 (0.08)	0.13 (0.08)
Task Inter. (CWP)	-	0.16 (0.09)	0.15 (0.09)	0.15 (0.08)
GR Goal Interest X Outcome Inter.	-	-	-	0.20 (0.10)*
GR Goal Perseverance X Outcome Inter.	-	-	-	-0.05 (0.10)
GR Goal Interest X Task Inter.	-	-	0.10 (0.09)	-
GR Goal Perseverance X Task Inter.	-	-	-0.09 (0.09)	-
Between Level				
GR Goal Interest (PM)	-	-0.08 (0.26)	-0.09 (0.25)	-0.07 (0.26)
GR Goal Perseverance (PM)	-	0.10 (0.29)	0.11 (0.29)	0.12 (0.29)
Outcome Inter. (PM)	-	0.00 (0.27)	0.15 (0.29)	0.17 (0.29)
Task Inter. (PM)	-	0.15 (0.29)	0.01 (0.27)	-0.06 (0.27)
ICC	.27	.29	.30	.28
Model Fit (Loglikelihood)	-156.44	-132.95	-132.15	-130.57
R^2 Within Level	-	0.24 (0.06)**	0.25 (0.06)**	0.27 (0.06)**
R^2 Between Level	-	0.05 (0.10)	0.05 (0.10)	0.06 (0.11)

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. CWP = Centered within person; PM = Person-mean, centered at the grand mean. *p < .05, **p < .001.

Figure 6 Interaction effect between outcome interdependence and group-referent goal interest on self-referent goal perseverance.

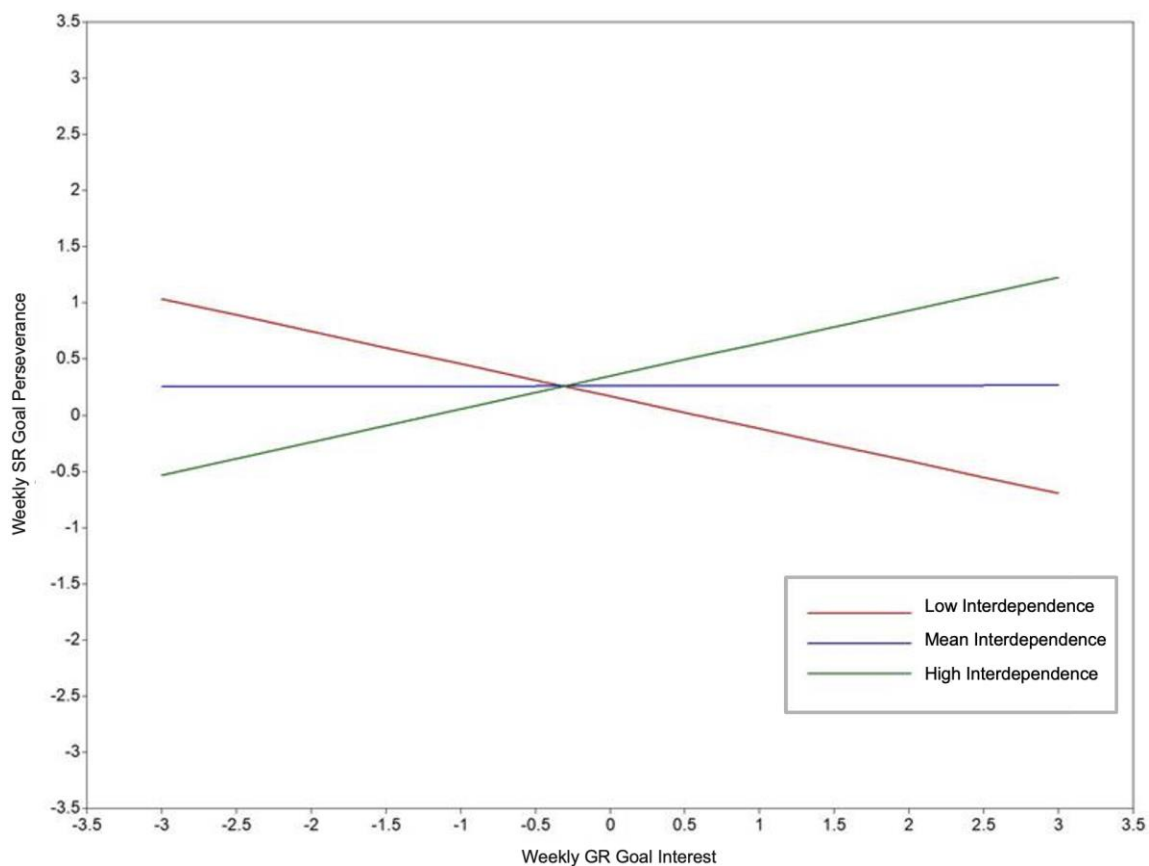*Note.* All variables are grand, and person mean centered.

Training environment characteristics were included as predictors in models that can be viewed in Table 12. SR goal interest demonstrated significant positive associations with GR goal interest ($\beta = 0.35$, $p < .001$) and weekly variance in how fun training was perceived to be ($\beta = 0.31$, $p < .001$), as well as a significant negative association with amount of training completed in the presence of teammates ($\beta = -0.18$, $p = .02$). Considering SR goal perseverance, both GR goal perseverance ($\beta = 0.37$, $p < .001$) and weekly variance in how intense training was perceived to be ($\beta = 0.29$, $p < .001$) exhibited significant positive predicative value. Additionally, at the between-person level, trait grit was found to have a significant positive relationship with SR goal perseverance ($\beta = 0.73$, $p < .001$).

Table 12 Multilevel models characterizing contextual and individual predictors of self-referent grit.

	SR Grit β (SE)	
	Goal Interest	Goal Perseverance
Random Effects		
Intercept	11.11 (2.91)	9.10 (2.33)
Fixed Effects		
Within Level		
Response Week (1-8)	0.04 (0.08)	-0.07 (0.08)
GR Goal Interest (CWP)	0.35 (0.08)**	-0.12 (0.08)
GR Goal Perseverance (CWP)	0.17 (0.09)	0.37 (0.09)**
Training (Intensity; CWP)	0.13 (0.10)	0.29 (0.10)**
Training (Volume; CWP)	-0.02 (0.10)	0.17 (0.10)
Training (Fun; CWP)	0.31 (0.08)**	0.13 (0.08)
Training (with Teammates; CWP)	-0.18 (0.08)*	-0.03 (0.08)
Between Level		
Trait Grit	0.27 (0.26)	0.73 (0.24)**
GR Goal Interest (PM)	0.48 (0.27)	0.07 (0.27)
GR Goal Perseverance (PM)	-0.38 (0.28)	0.24 (0.29)
Training (Intensity; PM)	-0.17 (0.25)	0.17 (0.26)
Training (Volume; PM)	0.30 (0.32)	0.27 (0.33)
Training (Fun; PM)	0.45 (0.19)*	0.28 (0.20)
Training (with Teammates; PM)	0.34 (0.22)	0.24 (0.22)
Model Fit (Loglikelihood)	-94.03	-83.46
R^2 Within Level	0.42 (0.07)**	0.41 (0.07)**
R^2 Between Level	0.84 (0.17)**	0.67 (0.19)**

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. CWP = Centered within person; PM = Person-mean, centered at the grand mean. *$p < .05$, **$p < .001$.

Regression models seen in Table 13 explore effects of SR grit, GR grit, and perceptions of the training context on relevant outcome variables. At the within-person level, SR goal perseverance (GP) and relative fun of weekly training (F) were positive predictors of positive affect (GP $\beta = 0.37$, $p < .001$; F $\beta = 0.33$, $p < .001$), goal achievement (GP $\beta = 0.20$, $p = .03$; F $\beta = 0.25$, $p < .001$), and performance achievement (GP $\beta = 0.31$, $p < .001$; F $\beta = 0.22$, $p < .001$). Additionally, SR goal interest was a positive predictor of

both goal achievement (β = 0.30, p < .001) and performance achievement (β = 0.28, p < .001).

Table 13 Multilevel models predicting weekly positive affect, goal achievement, and performance achievement in rowers.

	Outcome Variable β (SE)		
	Positive Affect	Goal Achievement	Performance Achievement
Random Effects			
Intercept	9.14 (1.90)	8.61 (2.06)	8.01 (1.93)
Fixed Effects			
Within Level			
Response Week (1-8)	0.04 (0.06)	0.04 (0.08)	0.02 (0.08)
SR Goal Interest (CWP)	0.11 (0.08)	0.30 (0.09)**	0.28 (0.09)**
SR Goal Perseverance (CWP)	0.37 (0.08)**	0.20 (0.09)*	0.31 (0.09)**
GR Goal Interest (CWP)	0.00 (0.07)	-0.10 (0.09)	-0.08 (0.09)
GR Goal Perseverance (CWP)	0.13 (0.08)	0.02 (0.09)	0.09 (0.09)
Training (Intensity; CWP)	0.00 (0.08)	0.08 (0.10)	-0.09 (0.10)
Training (Volume; CWP)	0.07 (0.08)	0.06 (0.10)	0.08 (0.10)
Training (Fun; CWP)	0.33 (0.07)**	0.25 (0.08)**	0.22 (0.08)**
Training (with Teammates; CWP)	0.08 (0.06)	0.07 (0.08)	0.06 (0.08)
Between Level			
Trait Grit	0.76 (0.28)**	0.17 (0.27)	0.20 (0.22)
SR Goal Interest (PM)	-0.08 (0.26)	-0.02 (0.26)	-0.09 (0.24)
SR Goal Perseverance (PM)	-0.05 (0.23)	0.31 (0.24)	0.18 (0.22)
GR Goal Interest (PM)	-0.26 (0.27)	0.80 (0.28)**	0.75 (0.30)*
GR Goal Perseverance (PM)	0.60 (0.28)*	-0.34 (0.28)	-0.30 (0.27)
Training (Intensity; PM)	-0.01 (0.21)	0.13 (0.22)	-0.06 (0.20)
Training (Volume; PM)	1.11 (0.28)**	0.42 (0.29)	0.26 (0.25)
Training (Fun; PM)	0.18 (0.18)	0.01 (0.19)	0.01 (0.18)
Training (with Teammates; PM)	0.14 (0.18)	0.24 (0.21)	0.70 (0.20)**
Model Fit (Loglikelihood)	-76.52	-111.83	-113.54
R^2 Within Level	0.63 (0.05)**	0.46 (0.07)**	0.47 (0.07)**
R^2 Between Level	0.80 (0.13)**	1.00 (0.11)**	1.00 (0.14)**

Note. SR = self-referent, GR = group-referent. Coefficients presented as standardized values using STDYX option within MPlus. CWP = Centered within person; PM = Person-mean, centered at the grand mean. *p < .05, **p < .001.

3.4   Study 2 Discussion

Capturing weekly variability in goal pursuit provides an opportunity to capture influences on our efforts to persist in key domains. An intensive longitudinal approach is particularly powerful for indexing social influences. Study 2 was conducted to examine how weekly variability in individual goal-related grit was predicted by perceptions of teammates and relevant contextual factors. In relation to weekly SR goal interest, participants reported greater interest in ongoing rowing-related goals during weeks when they perceived their teammates demonstrated both interest and perseverance. Still, there was a relatively stronger association between SR goal interest and GR goal interest. Considering weekly variability in SR goal perseverance, only GR goal perseverance appeared to be a significant predictor variable. These results provide support for Hypothesis 1.

I further hypothesized that weekly perceptions of interdependence in the training context would moderate associations between weekly SR grit and GR grit scores. Examining the associations between SR goal interest and GR grit dimensions with both task and outcome interdependence as exploratory moderators, the interaction term for GR goal interest and task interdependence was significant. I found a significant positive association between SR goal interest and GR goal interest at mean and high levels of task interdependence. Considering SR goal perseverance as the outcome variable, there was a significant interaction term for GR goal interest with outcome interdependence. Probing this further, there does not appear to be a significant association between SR goal perseverance and GR goal interest at the levels of the moderators that I examined. Still, simple slope analysis suggests the association is different at high and low levels of the moderator. It is plausible that a significant slope would be evident at more extreme levels of the moderator. These finding provide partial support for Hypothesis 2.

Relative to Study 1, Study 2 also introduced some unique associations of interest based on the competitive sport context and salience of sport-relevant outcomes. My third research question pertaining to how contextual features relate to weekly fluctuations in SR goal interest and goal perseverance did not have any specific hypotheses. Regressions indicated weekly perceptions of relative fun of training compared to typical weeks was

positively associated with weekly fluctuations in SR goal interest. Amount of time spent training around teammates was also negatively associated with weekly variability of SR goal interest. Findings also suggested weekly perceptions of how intense training was compared to typical weeks is positively associated with weekly SR goal perseverance.

Regressions on weekly self-reported positive affect, weekly ratings of individual goal achievement, and weekly perceptions of one's own performance suggest these outcomes are meaningfully associated with SR grit dimensions and perceptions of the training context. In other words, weekly fluctuations in SR grit as well as training environment perceptions relate to individual sport-relevant experiences. While SR goal interest and perseverance both related to key outcome variables, SR goal perseverance had a more comprehensive set of associations as it exhibited positive relationships with positive affect, goal achievement, and performance achievement. One finding of particular interest was the association between weekly perceptions of training fun and achievement-oriented outcome variables. It may be more commonly expected that weeks during which athletes experienced more intense or challenging training, they would be more likely to feel as though they had achieved greater goal outcomes. However, this association between training fun and goal/performance achievement does align with research on mental skills in athletes. For example, research on collegiate student-athletes has identified the importance of maintaining a positive perspective as one mental skill that may benefit performance (Donohue et al., 2020). Considering the relevance of group environments in goal pursuit and performance outcomes in competitive training contexts, it may be of particular importance to focus on more positive contextual aspects and fostering goal interest as opposed to leveraging goal perseverance and harsher conditions.

While exploratory analyses suggested within-person weekly variation in SR grit, GR grit, and perceptions of the training context are related to individual experiences within sport, I make no claim about potential causality in these relationships. Intensive longitudinal designs help researchers reduce error when making predictions – meaning they can produce precise estimates of effects – but they do not inherently demonstrate causality. Recall that the present analyses were contemporaneous, so the predictors and dependent variable indices were each being regressed alongside other variables from the same

timepoint. Causal effects can be more directly estimated with intensive longitudinal data using alternate analyses like cross-lagged models, dynamic structural equation models, or dynamic-p models (e.g., Bolger & Laurenceau, 2013). However, these analyses did not align well with the nature of grit variability (i.e., likely to be covarying, with little effect across weeks), and would likely demand a sample with a greater number of responses from each participant or a greater sample size.

Beyond these statistical constraints, a further Study 2 limitation involves the absence of nesting within rowing clubs. The 22 participants were distributed across different rowing teams, so nesting within groups was not possible. Lacking access to teammate survey responses limits the contextual interpretation of findings as individual perceptions cannot be situated alongside other team members' rating of the training context and group environment. While this study primarily aims to explore within-person weekly variability across relevant variables, exploration of the 'true' group environment may not be possible. However, this does not negate the value of findings as associations between key variables provides valuable support for how context-specific grit and perceptions of group environments shape weekly individual goal pursuit.

While employing an intensive longitudinal design addressed some concerns of Study 1, there are still some key considerations pertaining to the current sample and design. Collecting data from only one individual in a team context does not allow for general understandings of the group environment outside of the perceptions of one individual. Although exploring relationships in a competitive and clearly goal-oriented environment permitted me to examine how weekly variability in the training context and perceptions of teammates may influence individual goal pursuit and progress.

Chapter 4

4 General Discussion

The psychological construct of grit is a predictive factor in the individual performances of athletes, artists, cadets, students, and workers (Cormier et al., 2021; Duckworth et al., 2007; Jachimowicz et al., 2018). Less however, is known about grit within groups. Furthermore, limited research has explored how context-specific grit in a group setting may be shaped by perceptions of other members. The current research examined how variability in self-referent goal interest and goal perseverance may be related to variability in perceptions of group member's goal interest and perseverance. Study design and theorizing was guided by theories to explain both variation in grit (i.e., trait activation theory; Tett & Burnett, 2003) and to explain group environments as influential contributors to individual's goal pursuit (i.e., transactive goal dynamics theory; Fitzsimons et al., 2015). Across two studies I examined both the direct associations between SR and GR grit perceptions, and subsequently tested interdependence as a moderator in the relationship between SR and GR grit. Results broadly supported the notion that group environments shape individual's goal pursuits and that these associations may vary depending on perceptions of relevant contextual factors.

4.1 Interpreting Key Findings from Studies 1 and 2

My discussion first addresses the key finding suggested by analyses that participants' weekly pursuit of group-related goals was associated with their perceptions of group member goal pursuit. Across two studies, regression results suggest perceptions of group members' goal interest and goal perseverance are related to self-reported goal interest and goal perseverance. As was anticipated, SR grit scores were more closely related to GR grit scores of the same dimension (e.g., SR goal interest was more strongly associated with GR goal interest). This finding aligns with the broad tenets of TGD highlighted throughout my thesis, and specifically the concept of transactive gain. Transactive gain is theorized to exist when individuals within teams experience increased achievement or demonstrate more consistent goal pursuit behaviors within their group compared to what they may achieve independently (Fitzsimons et al., 2016). This gain arises from a

collection of cognitive and motivational processes that are coordinated across group members and the existence of interdependencies in goal pursuit. Findings that SR grit is associated with GR grit relates to this tenet of transactive gain insofar as it suggests members' goal pursuits are likely intertwined and the social influence present in these settings can positively impact individual's goal-related outcomes.

Study 1 sought to examine how between-person variance in SR goal interest and goal perseverance related to variance in GR goal interest and goal perseverance. Controlling for demographic variables and partialing-out variance attributed to trait conscientiousness, regression models suggest SR goal interest to be significantly associated with GR goal interest. In contrast, regression models considering SR goal perseverance did not find either GR grit dimension to be significantly related to reported scores. These findings suggest SR goal interest may be more strongly related to perceptions of the group context in a student club sample. Interpreting this finding in relation to TGD, as student clubs are primarily interest driven, there may be increased levels of opportunity and motivation for overlapping interests with group members as opposed to group membership being driven by similarities in perseverance for goals.

Building from Study 1, my second study aimed to explore how relationships between SR grit and GR grit in a specific context fluctuate on a weekly basis and what sort of within-person interactions between variables emerge. Results showed weekly SR goal interest had significant positive correlations with weekly SR goal perseverance and GR goal interest as well as a small but significant positive correlation with GR goal perseverance. Further, weekly SR goal perseverance had a moderate significant positive correlation with GR goal perseverance. These effects were similarly evident within regressions as weekly SR goal interest was predicted by GR goal interest. Meaning, at the weekly level, a significant proportion of SR goal interest is explained by variance in GR goal interest. Variability in SR goal perseverance was similarly associated with changes in GR goal perseverance. Findings support my expectations about the shared variability in one's own weekly goal pursuit and the perceptions of teammate's goal pursuit. In line with TGD theorizing, team members are attentive toward the goal pursuits of others who can shape the value or salience of related goals. Of course, I do not directly interpret these effects as

evidence that teammate goal pursuit caused changes in individual goal pursuit because this study was observational and focused on athletes' own perceptions of their group.

Still, the intensive longitudinal design provided particular sensitivity to effects at a within-person level. This means that Study 2 findings explore features that might predict *when* people demonstrate more (or less) grit, as opposed to exploring *who* will demonstrate grit. Within-person effects highlight the potentially transient nature of our experiences with teammates' goal pursuit. These experiences are likely dynamic and could emerge through several paths including goal priming, social support, and fluctuations in goal salient contextual variables.

One important consideration in the interpretation of these results encompasses differences in the effects found in each study. Most notably, Study 1 looked at between-person effects and relationships between variables of interest whereas Study 2 examined within-person effects in relation to deviations from weekly norms. From a purely statistical perspective, within-person effects are more precise measurements of between-person effects as they specifically capture fluctuations and deviations from one's average response to measures, thereby factoring-out stable features of the individual that shape responding patterns. From a conceptual perspective, within-person measures may capture entirely different effects altogether. As suggested by Bolger and Laurenceau (2013), relationships between variables at the between- and within-person levels may be different sizes or even directions. Therefore, based on the current studies, I do not presume that the between-person effects outlined in Study 1 are able to be directly compared to within-person effects in Study 2. And as the between-person effects of Study 2 are underpowered, it is not possible to reasonably consider relationships explored to be examining the same effects across studies. A between-person effect in the current research suggests differences in SR grit are associated with varying perceptions of group members and the collective environment. More broadly, these effects can be interpreted as indicating individual's goal pursuit is shaped by their view of the group. Whereas within-person effects can be interpreted alongside studies with similar intensive longitudinal designs (e.g., Di Sarno et al., 2023; Doorley et al., 2022) to indicate variability in context-specific grit is associated with state-level perceptions of the group

environment and other members context-specific grit. Overall, between- and within-person effects deviated slightly from one another when looking specifically at each study.

Recall my second research question probed moderating effects of perceived interdependence in the relationship between SR and GR grit dimensions. Task interdependence was measured in both studies, and outcome interdependence was captured in Study 2 alone. Whereas findings varied slightly across samples, broadly this research supported hypothesizing that perceptions of interdependence moderate the relationship between SR grit and GR grit.

In Study 1, SR goal interest regression models found perceived interdependence produced a significant interaction term with both GR goal interest and GR goal perseverance. With this sample of student club members, the influence of perceived club member goal interest was only predictive of one's own goal interest for participants who felt they were interdependent with other club members in their group-related tasks. Examining potential moderating effects of task interdependence in the relationship between GR goal perseverance and SR goal interest, a similar interaction term was evident but there was a different effect found. Notably, results suggest when low interdependence is perceived in student clubs, individuals may experience lower goal interest when perceiving higher goal perseverance in other club members. Considering these findings in the context of TGD theory, goal pursuit in group settings may not always result in transactive gain. When individuals perceive there to be little interdependence in their group, perceptions of other member's grit may be less salient on their own goal pursuit experience or even have negative impacts.

For Study 2, models examining weekly SR goal interest found no significant interaction terms with outcome interdependence although the interaction term for task interdependence and weekly GR goal interest was significant. Probing this interaction further, I found that for weeks during which individuals perceived mean or high levels of task interdependence, there was a significant positive association between GR goal interest and SR goal interest. This finding supports theorized relationships outlined in TGD theory. Therefore, results suggest weekly variability in levels of task

interdependence perceived in the training environment may cause perceptions of teammates goal interest to be more salient in one's own experience of weekly goal interest. Considering effects on weekly SR goal perseverance, one significant interaction term was found for outcome interdependence and GR goal interest. Decomposing effects at low, mean, and high levels of the moderator, significant associations were not found between SR goal perseverance and GR goal interest at any levels of outcome interdependence examined. However, it is possible that at more extreme values of the moderator, significant associations may exist. Additionally, analyses found the slopes of association at high and low levels of outcome interdependence to be significantly different from one another. Overall, these results can be interpreted to suggest that weekly variability in ratings of outcome interdependence may be related to different associations between weekly perceptions of teammate goal interest and individual's own weekly goal perseverance.

In Study 2, I also explored contextual predictors of weekly SR grit. Weekly SR goal interest was, for example, positively associated with perceptions of training enjoyment as weeks where athletes viewed their training as more fun than typical weeks were those when they were more interested in their rowing goals. This finding is intuitive but does demonstrate that SR grit may vary as would be theorized. Models also revealed a negative association between amount of training around teammates and SR goal interest. This pattern could have several explanations. Whereas such a pattern could reflect intrateam competition, it is also plausible that weeks with more time spent around teammates could reflect another third variable (e.g., weeks during which testing is taking place). Additionally, rowers' weekly perceptions of training intensity compared to average weeks was predictive of SR goal perseverance. This effect could plausibly unfold in two directions: it could be that when athletes are persevering in training, they attain more success achieving higher intensity, or that high intensity training weeks are a 'signal' that one is working harder in pursuit of their goals. Notwithstanding the varying interpretations of each effect, one broad interpretation of these effects was that SR grit perceptions did show weekly variability that was related to key features of the physical and social training environment of competitive rowers. Research and theory outlined in exercise literature provides a framework through which these findings can be interpreted.

For example, the Affective-Reflective Theory (ART) of exercise and physical inactivity posits individuals affective experience is inextricably linked to their motivation and exercise behavior (Ekkekakis & Brand, 2021). Individuals perceiving weekly variance in training intensity and fun are likely to be experiencing affective responses that may make it easier and more pleasurable to demonstrate passion and persistence.

Beyond the key findings of this research relating to theory, I also tested a novel approach to measuring grit in relation to context-specific goal pursuit. Items were adapted to capture goal interest and goal perseverance in relation to student clubs (Study 1) and rowing training (Study 2). I also constructed scales to both measure SR grit as well as GR grit (i.e., how other members of the group appear to pursue their goals). I found across contexts, a two-factor structure was most appropriate for both SR and GR grit measures. While fit indices for final models in both studies exhibited ideal model fit, there were some items that did not load especially well onto grit dimensions. One explanation for this could be that using both negatively and positively worded items in the scale may be associated with challenges in correctly estimating factor loadings and associations. Indeed, the use of negatively-worded grit items has been criticized (Credé & Tynan, 2021). Future research should consider re-wording items to reflect all positive or all negative wording as opposed to having different valence of wording for each dimension's items. Establishing a two-factor structure was ultimately important, provided the conceptual value of distinguishing passion and perseverance to mitigate concerns about muddying operationalizations within grit literature (e.g., Credé et al., 2017).

4.2   Limitations and Future Directions

Measuring SR and GR grit, key individual variables, and perceptions of the group context at both between- (i.e., Study 1 cross-sectional design) and within-person levels (i.e., Study 2 weekly diary design) in my two studies was done through self-report survey measures. Identified limitations encompass relevant methodological considerations while future directions outline both research-based approaches to build on findings and applied implications of current results. Within both cross-sectional and intensive longitudinal study designs, one important limitation to consider is the presence of common method variance (Podsakoff et al., 2003). Potential sources of method bias that may have

impacted my studies include various types of common rater effects, item effects, and measurement context effects (Podsakoff et al., 2024). Incorporating an intensive longitudinal design alongside a larger cross-sectional study addresses some sources of common rater effects as I was able to parse out individual tendencies by centering weekly data within the context of within-person means. This means that Study 2 was resistant to several contributors to bias that are specifically contingent on between person differences like response styles, social desirability, and leniency bias. Both studies nevertheless feature common raters for the independent and dependent variables: SR and GR grit perceptions. Without comparing GR grit perceptions with actual group member SR grit ratings, I am not able to dissect response variance attributed to each individual. Biases associated with common method variance could lead to inflated estimates of the relationship between SR grit and GR grit (Jordan & Troth, 2020) both within individuals over time and between individuals.

It is also contentious to state individuals were able to accurately perceive their group members' actual grit scores, so group-referent variables should not be taken as a corollary to actual teammate grit. I nevertheless anticipate that individuals' perceptions of group member goal interest and perseverance are important inputs into individual goal pursuit. Whether or not other members themselves feel like they are pursuing goals with particular perseverance and interest, just the perception that they are may be increasingly salient to one's own goal pursuit. Therefore, it is still meaningful to measure perceptions of GR grit as the experience of transactive gain is less dependent on objective values of others and more dependent on how perceptions of others influence individual's goals. Future research should however consider collecting data from intact teams to more readily interpret how perceptions of teammates relate to self-reported scores as well as directionality of social influence in groups.

A further limitation relates to clustered samples incorporating relatively limited numbers of Level 2 units. In Study 1, data were collected from 13 clubs meaning between-person responses were nested within 13 higher level units. In Study 2, within-person weekly responses were clustered within 22 individual participants. While analyses in Study 1 were only conducted at Level 1 incorporating robust standard errors to account for

clustering, Study 2 analyses incorporated full multilevel models. In both studies however, several analyses were underpowered and in the case of Study 2, between-person effects should be interpreted with caution. This limits the interpretation of findings between the two studies as between-person effects cannot be reasonably compared. This low power at the highest level of analysis also prevented me from conducting cross-level moderations. These cross-level analyses would be able to examine whether a dispositional feature (e.g., trait grit) might moderate the weekly associations between variables.

There are various avenues through which future studies could effectively build on current findings. Future research should consider collecting data from intact teams to more readily interpret how perceptions of teammates relate to self-reported grit scores as well as directionality of social influence in groups. Considering measuring grit within teams raises the potential to perceive teammate grit through an entirely different lens. My study focuses on how team settings shape weekly manifestations of trait grit. Fewer studies have examined grit in a team setting by considering both (a) how grit manifests across teams, and (b) how grit can be measured at a team level. Grit has indeed been theorized to exist as a team-level emergent state unique from the individual-level trait (Bernardy & Antoni, 2021). Numerous existing team level constructs also map on to group-level grit. Similar to resilience in individuals, team resilience is a group level construct that only exists in response to adversity (Stoverink et al., 2020) and therefore conceptually contrasts grit. The potential for group-level grit emerging as a collective construct should be explored in future research as overall team grit could also impact variability in individual goal interest and goal perseverance.

Another future direction researchers should explore is the additive value of incorporating social network analyses in the exploration of social influences in relation to context-specific grit. Social network analysis (SNA) can be leveraged to capture how certain individuals within a group setting may be more closely related through mutual nomination and thus may be more saliently influencing each other compared to other members of the group (Wölfer et al., 2015). Particularly in larger groups represented in the Study 1 sample, it is naïve to presume perceptions of all group members carry the same weight as perceptions of others with whom the individual is closer to through

increased interaction. SNA could provide a fruitful dissection of the influence associated with group members who are nominated by each individual; with the aim of parsing apart how individuals are influenced by their closest peers as opposed to their general perceptions of group members.

Provided the links explored between one's own goal pursuit and that of teammates, there are several potential practical applications of findings like those from the current research. For example, one relevant intervention focus could be on the degree to which group members are exposed to one another's goal pursuit efforts or building awareness of what other members are pursuing. This would align with findings of Reynolds and colleagues (2019) that when members of a weight loss group were aware of other member's goals and perceived others to be achieving their goals, they felt more positively about their own goal pursuit and progress. Another intervention focus could target group training on social support behaviors and how to prime and support each other's goal pursuit more explicitly. Social support has been associated with both negative and positive goal pursuit outcomes although, one recent study demonstrated how individuals conceptualize social support may be the key to whether they experience better (or worse) goal outcomes (Lee & Ybarra, 2017). By teaching group members about social support as well as the ways in which they may be the most likely to succeed with support from others, transactive gain may be a more likely outcome of goal pursuit in group settings.

4.3   Conclusion

In closing, results across two studies provide evidence for the emergence of context-specific goal-related grit. In line with transactive goal dynamics theory, recently proposed as an explanation for how individuals in group settings influence each other's goal pursuit, I hypothesized that perceptions of the group environment would be associated with self-referent grit. Additionally, I posited relevant environmental and contextual factors which would impact the experience of goal pursuit and its relationship with perceived others' goal pursuit. This research presents both theoretical and practical implications. Evidence for the relationships posited by Fitzsimons and colleagues (2016) in transactive goal dynamics theory advances understandings of social influence in goal pursuit and applications of theory outside research. For example, this research could be

applied to better predict individual goal pursuit in group settings and the anticipation of similarities between group members would permit the formation and development of more effective groups in the workplace. These studies explore how we may be influenced by others when pursuing goals in group contexts. Although, research should continue to unpack associations at both the within- and between-person levels to deepen understandings of how the groups we belong to can be leveraged to enhance our grit and goal pursuit outcomes.

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Appendices

Appendix A: Adapted grit items.

Original items.	Adapted self-referent items. "This week as a club member I…"	Adapted group-referent items. "This week members of my club appeared to…"
I often set goals but later choose to pursue a different one[R].	Set goals at the start of the week but ended up pursuing different ones[R].	Set goals at the start of the week but end up pursuing different ones[R].
New ideas and new projects sometimes distract me from previous ones[R].	Was distracted from previous ideas by newer club-related ideas and projects[R].	Be distracted from previous ideas by newer club-related ideas and projects[R].
I have been obsessed with a certain idea or project for a short time but later lost interest[R].	Gave up on some of my plans for club-related activities[R].	Give up on some of their plans for club-related activities[R].
I have difficulty maintaining focus on projects that take more than a few months to complete[R].	Had difficulty maintaining focus on my goals[R].	Have difficulty maintaining focus on their goals[R].
I finish whatever I begin.	Finished whatever I began.	Finish whatever they began.
Setbacks don't discourage me.	Was not discouraged by setbacks.	Not be discouraged by setbacks.
I am diligent.	Was diligent in pursuing my goals.	Be diligent in pursuing their goals.
I am a hard worker.	Worked exceptionally hard in pursuing my goals.	Work exceptionally hard in pursuing their goals.

[R]Reverse-coded item.

Appendix B: Mplus code for multilevel models.

Two-factor ESEM

```
DATA:
  FILE IS C:\Users\Evans Lab\Desktop\Rach stuff\Club data\ClubdataApr18.dat;
VARIABLE:
  NAMES = ID clubID CI1 PE1 CI2 PE2 CI3 PE3 CI4 PE4 v11-v13 IndCI ClbCI v16
  IndPE ClbPE v19 TCI1 TPE1 TCI2 TPE2 TCI3 TPE3 TCI4 TPE4 v28-v30 IndTCI ClbTCI
  IndTPE ClbTPE v35-v39 IndIntr ClbIntr v42-v54 IndSocId v56-v58 ClbSocId v60-v100
  IndCons ClbCons v103 sex age ClbYrs v107-v109 EIntr ClbEIntr v112-v127 ClbSex
  ClbAge IntrC CIC PEC TCIC TPEC ConsC v136-v138 SocIdC;
  MISSING ARE ALL (-999);
  USEVARIABLES ARE CI1 CI2 CI3 PE1 PE2 PE3;
ANALYSIS:
  ESTIMATOR=ML;
  ROTATION=TARGET;
MODEL:
  CI BY
  CI1-CI3
  PE1-PE3~0(*1);
  PE BY
  PE1-PE3
  CI1-CI3~0(*1);
OUTPUT:
  stdyx;
  tech4;
  MOD(0);
```

Moderation

```
DATA:
  FILE = C:\Users\Evans Lab\Desktop\Rach stuff\feb12row.dat;
VARIABLE:
  NAMES = ID v2 v3 week IndGrWk TmGrWk sex age comp TmGrM IndGrM PAWk TrtGr
        PerfM ColM IntrxnM TrIntM TrVolM TrFunM TrPercM TrInt TrVol
        TrFun TrPerc Perf Col Intrxn CI1 PE2 CI3 PE4 PE5 CI6 TmCI1 TmPE2 TmCI3
        TmPE4 TmPE5 TmCI6 v40-v47 CIWk PEWk TmCIWk TmPEWk CIM PEM TmCIM TmPEM;
  MISSING ARE ALL(-999);
  CLUSTER = ID;
  WITHIN = week Perf Col TmCIWk TmPEWk PEXPe CIXPe;
  BETWEEN = TmCIM TmPEM PerfM ColM;
  USEVARIABLES = ID week PEWk Perf TmCIWk TmPEWk TmCIM TmPEM PerfM Col ColM PEXPe CIXPe;
DEFINE:
  CENTER TmCIWk TmPEWk Perf Col(groupMEAN);
  CENTER TmCIM TmPEM PerfM ColM(grandMEAN);
  PEXPe = TmPEWk * Perf;
  CIXPe = TmCIWk * Perf;
ANALYSIS:
  TYPE = TWOLEVEL;
  ESTIMATOR = ML;
MODEL:
  %WITHIN%
  PEWk ON week TmCIWk TmPEWk Col Perf PEXPe CIXPe;
  %BETWEEN%
  PEWk ON TmCIM TmPEM ColM PerfM;
OUTPUT: STDYX cinterval;
```

Appendix C: Study 1 ethics approval

M. Blair Evans

From:	wremsend
Sent:	Wednesday, August 10, 2022 10:33 AM
To:	Michael Evans; wrem; Roy Hui
Cc:	gm-certification
Subject:	NMREB initial application approved - Small Group Social Network Survey (REB# 120870)
Attachments:	Letter.pdf

Project ID: 120870

Study Title: Predicting Influence and Position in University Student Groups: A Social Network Approach

Study Short Title: Small Group Social Network Survey

REB Approval Expiry Date: 10/Aug/2023

Applicant Link: https://applywesternrem.uwo.ca/Project/Index/1046425

Western University's NMREB has approved the Initial Application for the above noted study. **All other required institutional approvals must also be obtained prior to the conduct of the study at this research site.**

COVID-19: Please note that REB approval does not equate to this study being appropriate to conduct during the COVID-19 outbreak. Principal Investigators, in consultation with their program leader or Department Chair/Chief, should use their best judgement AND consult institutional (Western/Lawson) directives about whether the study can safely take place at this time and/or what modifications may be required. Compliance with institutional, provincial, and national guidelines along with participant and staff safety supersede REB approval.

COVID-19 Resources for the conduct of research:

REB Memos

Western FAQ

Please log in to WREM to view the correspondence from the REB.

If you have any questions about the WREM System or need technical assistance please contact wrem@uwo.ca.
If you have any questions about the ethical content of this application, please contact ethics@uwo.ca.

Appendix D: Study 2 ethics approval

M. Blair Evans

From:	wremsend
Sent:	Thursday, January 19, 2023 11:47 AM
To:	Michael Evans; wrem; Karissa Riley
Cc:	gm-certification
Subject:	NMREB initial application approved - Rowing Teams Study. (REB# 121710)
Attachments:	Letter.pdf

Project ID: 121710

Study Title: When Teamwork makes the Dream Work: The Psychology of Teams and Beliefs about Performance

Study Short Title: Rowing Teams Study.

REB Approval Expiry Date: 19/Jan/2024

Applicant Link: https://applywesternrem.uwo.ca/Project/Index/1050734

Western University's NMREB has approved the Initial Application for the above noted study. **All other required institutional approvals must also be obtained prior to the conduct of the study at this research site.**

COVID-19: Please note that REB approval does not equate to this study being appropriate to conduct during the COVID-19 outbreak. Principal Investigators, in consultation with their program leader or Department Chair/Chief, should use their best judgement AND consult institutional (Western/Lawson) directives about whether the study can safely take place at this time and/or what modifications may be required. Compliance with institutional, provincial, and national guidelines along with participant and staff safety supersede REB approval.

COVID-19 Resources for the conduct of research:

REB Memos

Western FAQ

Please log in to WREM to view the correspondence from the REB.

If you have any questions about the WREM System or need technical assistance please contact wrem@uwo.ca. If you have any questions about the ethical content of this application, please contact ethics@uwo.ca.

Curriculum Vitae

Rachel Edwards

EDUCATION

Bachelor of Arts (Distinction), Psychology, University of Alberta　　2022
Topic: Team grit and team performance
Supervisor: Rebecca Purc-Stephenson, Ph.D.

AWARDS

Ontario Graduate Scholarship ($15,000)　　2023-2024

Ontario Graduate Scholarship ($15,000)　　2024-2025

TEACHING EXPERIENCE

TEACHING ASSISTANT
Fall 2022 PSYCHOL 1002A *Psychology as a Natural Science*　　2022-2023
Winter 2023 PSYCHOL 1002B *Psychology as a Social Science*
Winter 2024 PSYCHOL 2811B *Statistics for Psychology I*　　2023-2024

RESEARCH

PUBLICATIONS

Purc-Stephenson, R. J., Zimmerman, T. M. J., & **Edwards, R**. (2022). Motivation to train during a pandemic: The role of fitness resources, mental health, and motivational profiles among student-athletes in team sports. *Frontiers in Sports and Active Living,* 4. https://doi.org/10.3389/fspor.2022.954086

PRESENTATIONS

Edwards, R., Riley, K., & Evans, M. B. (2024, July). *Social influence and weekly goal pursuit: An intensive longitudinal study.* Presentation accepted at Interdisciplinary Network for Group Research (INGRoup), Charlotte, NC.

Edwards, R., Evans, M. B., Slack, M., & Evans, J. C. (2023, October). *Team cognition in flight-based paramedicine: Relevant qualitative insights from paramedics and physicians.* Presentation at Centre for Education Research and Innovation (CERI) Annual Research Symposium, London, ON.

Edwards, R., Lundale, C., Khurram, A., Slack, M., Evans, J. C., & Evans, M. B. (2023, July). *Team cognition: Qualitative insights from paramedics and physicians regarding flight-based paramedicine.* Presentation at Interdisciplinary Network for Group Research (INGRoup), Eastside of Seattle, WA.

Edwards, R., Purc-Stephenson, R., & Zimmerman, T. (2022, October). "Just Train at Home": The role of fitness resources, mental health, and motivational profiles among student-athletes during the pandemic. Poster presented at Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS), Montréal, QC.

KNOWLEDGE TRANSLATION & COMMUNITY-ORIENTED REPORTS

Edwards, R., Harrington, N., Misener, L. (2023). *Adaptive Sport & Recreation at Ontario Post-Secondary Institutions.* Ontario Parasport Collective (funded by Trillium Foundation).