

Comparison of the Effects of Group Running and Solo Running on Alleviating Negative Emotion: The Mediating Roles of Exercise Intention, Social Attributes, and Self-Regulation

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Abstract

Against the backdrop of increasing mental health challenges in modern society, exercise has gained significant attention as an effective strategy for emotion regulation. This study aims to compare the effects of group running and solo running on alleviating negative emotions and to examine the mediating roles of exercise intention, social attributes, and self-regulation. A mixed methodology was adopted, comprising an online questionnaire survey of 115 participants with running experience in the past three months, supplemented by in-depth interviews with representative runners and a psychological counselor. The results indicate that both forms of running effectively alleviate negative emotions. Group running demonstrates significant advantages in enhancing exercise intention and providing social support, thereby proving more effective in mitigating negative emotions. In contrast, Solo running offers greater benefits in terms of time flexibility and self-regulation. The findings suggest that group running holds considerable potential as a mental health intervention, though both forms possess distinct application value for different populations.

Keywords

Group running; Solo running; Negative emotions; Exercise intention; Social attributes; Self-regulation.

1. Introduction

With the accelerating pace of modern life and the widespread increase in psychological stress, negative emotional issues such as depression and anxiety have become significant public health concerns. Individuals under chronic stress often exhibit symptoms like recurrent self-blame, rumination, and emotional exhaustion, which not only significantly reduce quality of life but also impose a sustained burden on the public healthcare system.

Among various emotion regulation strategies, exercise is widely regarded as an effective approach due to its accessibility, low cost, and dual physiological-psychological benefits. Running, as one of the most prevalent forms of aerobic exercise, has been extensively shown to improve mood states by promoting the release of neurotransmitters such as endorphins and dopamine, and by enhancing self-efficacy through achieving exercise goals^[1]. However, existing research has primarily focused on the benefits of running itself, leaving a gap in the systematic exploration into the differences in emotion regulation mechanisms and actual effects between different running forms—particularly group running versus solo running.

Group running combines physical activity with social interaction, potentially alleviating negative emotions and rumination more effectively through mechanisms such as social support, sense of group belonging, and external motivation^[2]. Solo running, emphasizing self-control, intrinsic motivation, and self-regulatory processes, may offer unique advantages in enhancing emotional clarity and psychological calmness. Currently, research directly comparing these two

running forms and examining their underlying mediating mechanisms—such as exercise intention, social attributes, and self-regulation—remains limited.

Therefore, this study aims to employ a mixed-methods approach to compare the effects of group running and solo running on alleviating negative emotions among adults and to investigate the mediating roles of exercise intention, social attributes, and self-regulation.

2. Literature Review

2.1. Exercise and Emotion Regulation

The relationship between exercise and mental health has become a significant topic in psychology and sports science. Extensive research indicates that regular physical activity not only enhances physical fitness but also positively promotes emotion regulation [3]. Running, as a typical aerobic exercise, is widely accessible and highly participated in among the general public[4], making it an ideal subject for studying the exercise-emotion relationship.

From a physiological perspective, running promotes the release of neurotransmitters such as endorphins, serotonin, and dopamine, thereby improving neurotransmitter balance[5]. Neuroimaging studies further suggest that moderate-intensity running can modulate the functional networks of the amygdala, inhibit the intensity of negative emotions, and simultaneously enhance behavioral vitality[6]. From a psychological mechanism standpoint, running significantly enhances an individual's self-efficacy through setting and achievement[7]. Positive feedback from exercise applications further reinforces exercise adherence, providing individuals with a sense of accomplishment and satisfaction.

2.2. The Roles of Exercise Intention, Social Attributes, and Self-Regulation

Exercise intention significantly influences mood improvement. A positive attitude toward sports is correlated with lower levels of depression[4]. Motivation type plays a key role: intrinsic motivation (interest, autonomous choice) leads to more sustained mood improvement compared to extrinsic motivation (e.g., appearance, social pressure) [8].

Social attributes are particularly prominent in group running. Aral and Nicolaides[2] demonstrated that running behavior is contagious within social networks: for every additional common friend, exercise frequency increased by 0.571 units, indirectly reducing depressive symptoms by 17.03%. Group running not only promotes exercise adherence through social incentives but can also alleviate social anxiety. For instance, Tang et al. [9] found that a 10-week group running program significantly reduced interpersonal sensitivity among university students. This aligns with research from Amsterdam indicating that group runners show better depression remission rates compared to solo exercisers.

Self-regulation is more prominent in solo running, allowing individuals to focus on internal states and achieve emotion regulation through self-awareness and reflection. This form of exercise is considered particularly suitable for individuals seeking solitude and cognitive reorganization.

2.3. Research Gap and Contributions

Although existing research has confirmed the emotional benefits of running, comparative studies on different running forms remain relatively scarce. Few studies have systematically examined the differential effects of group versus solo running—including the mediating roles of exercise intention, social attributes, and self-regulation.

This study aims to address this gap by providing empirical evidence on the psychological mechanisms of different running forms and offering theoretical support for tailored exercise-based mental health interventions.

3. Research Methods

This study adapted a mixed-methods design, primarily utilizing a cross-sectional questionnaire survey supplemented by in-depth interviews. The questionnaire, based on established scales and literature, included four core sections: depression levels, measured using the Self-Rating Depression Scale (SDS); the exercise intention section drew on items used in studies by Lian Wenbo [4] and Zhang Renren et al.[8], e.g., "I am willing to continue running in the future"; the health perception dimension was based on the framework proposed by Zhang Jian [1], assessing positive emotion enhancement, negative emotion reduction, reduced rumination, and overall physical and mental satisfaction; social attributes were adapted from the research of Aral and Nicolaides[2], measured across three aspects: social support, social interaction, and improved social anxiety.

Data collection was conducted through an online platform (Tencent Questionnaire) combined with offline running communities. A total of 115 questionnaires were collected. The sample targeted the general adult population without specific age or occupational restrictions. Building on the quantitative analysis, to further reveal the internal mechanisms through which different running forms affect mood and individual experiential differences, purposive sampling was used to select three typical interviewees for semi-structured interviews. The interview guide was designed based on the research framework, focusing on running experience, emotional change processes, adherence motivation, and perceptions of social aspects or self-regulation etc. Interviewees included Li (a high school student) representing solo running habits, Liu (an experienced running group member) representing group running experience, and Wang (a national certified psychological counselor) providing professional analysis of exercise psychological mechanisms. Interviews were conducted after questionnaire data analysis, lasting approximately 30 to 45 minutes each. The process was audio-recorded with consent and transcribed for subsequent qualitative analysis to deepen and supplement the quantitative results.

4. Research Results

4.1. Sample Characteristics and Exercise Habits

This study recruited 115 participants through social media platforms and running communities between July and August 2025. Among the respondents, 52.2% were male and 47.8% were female, with an average age of 36.9 years ($SD = 13.1$). Regarding running habits, 68% individuals primarily ran alone, 12% primarily ran in groups, and 20% participated in both forms. This distribution provides a reliable sample basis for comparing the differences between group and solo running in alleviating negative emotion.

4.2. Differences Between Group and Solo Running in Alleviating Negative Emotions

Results indicated that group running was more effective than solo running in alleviating negative emotions. As shown in Figure 1, over 85% group runners reported high levels of agreement on the indicators "enhancement of positive emotions," "alleviation of negative emotions," and "reduction in rumination," significantly higher rates than those observed among solo runners. Notably, nearly 30% of solo runners rated the effect of rumination as neutral or insignificant, whereas group running received almost exclusively positive evaluations. This suggests that the social interaction and atmosphere of group running may play a key role in disruption cycles of negative rumination.

Solo running also demonstrated beneficial effects, with more than 80% of participants reporting agreement on items related to "calm/relaxation" and "emotional relief" (Figure 2),

highlighting its unique value in fostering self-focused relaxation. However, compared to group running, solo running's overall agreement rates and "completely agree" proportions were 5-15 percentage points lower, indicating a relative disadvantage, particularly in regulating rumination.

In-depth interviews supported these findings. Li, a solo runner, stated in the interview that physical fatigue during solo running can sometimes override emotional pain, thereby indirectly alleviating negative emotions. Furthermore, Wang, the psychological counselor, pointed out that solo exercise helps individuals focus on bodily sensations and a sense of control, a process similar to meditation that can enhance emotional clarity and psychological calmness.

Another group runner mentioned that during companion running, "emotions are more easily influenced " and "group running brings higher excitement and persistence motivation, helps clear the mind, often leads to quicker problem-solving during the run, and results in greater emotional relief afterward." Counselor Wang also pointed out that the social context of group exercise can serve as a distinction, increasing individual adherence and making it easier to reach the threshold for mood improvement. In contrast, Li emphasized the value of solo running in "helping to organize thoughts and override emotional pain," indicating differences in the emotion regulation mechanisms of the two forms.

Health Perception in Group Running

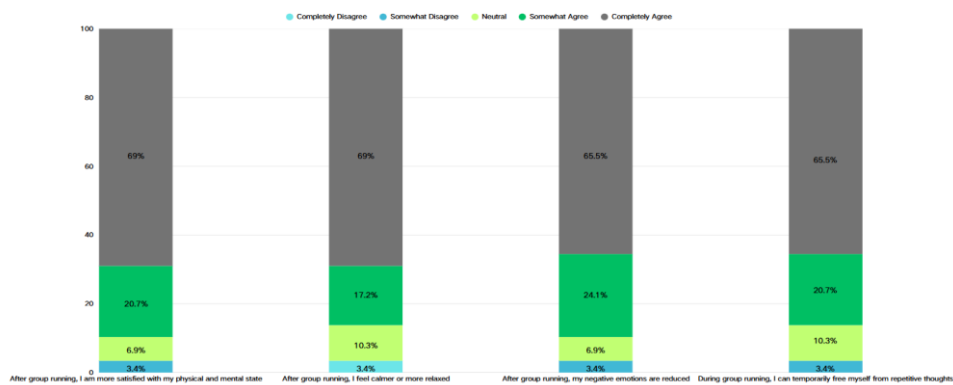


Figure 1: Health Perceptions After Group Running

Health Perception in Solo Running

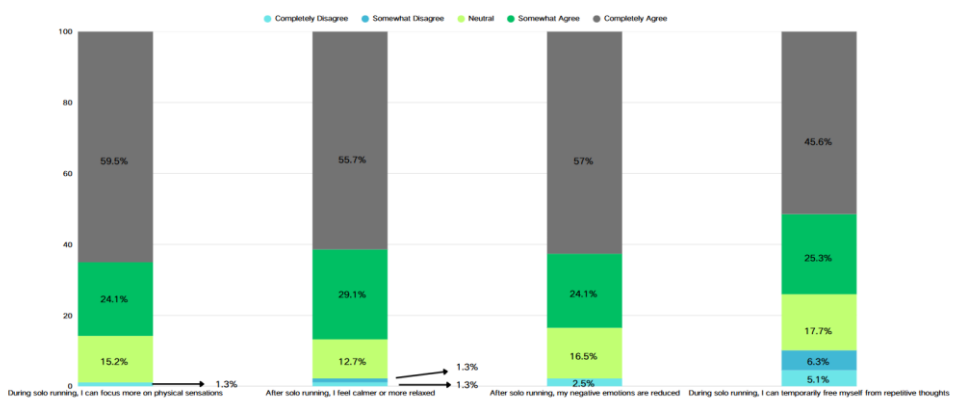


Figure 2: Health Perceptions After Solo Running

4.3. Exercise Intention: Slightly Higher in Group Running

Regarding exercise intention, group runners exhibited slightly higher levels. As illustrated in Figure 3, group runners had an average score of 4.5 (79.3% scoring ≥ 4) on the item "Group

running gives me motivation to exercise," and an average score of 4.3 on "It's easier to stick to plans when someone arranges to run together," reflecting the significant role of social support. Solo runners scored higher on "free time arrangement" (M = 4.5), reflecting a preceived advantage of time flexibility and autonomy. Overall, the comprehensive exercise intention strength for group running (M = 4.4) was slightly higher than for solo running (M = 4.3).

Histogram of Exercise Willingness Scores in Group Running

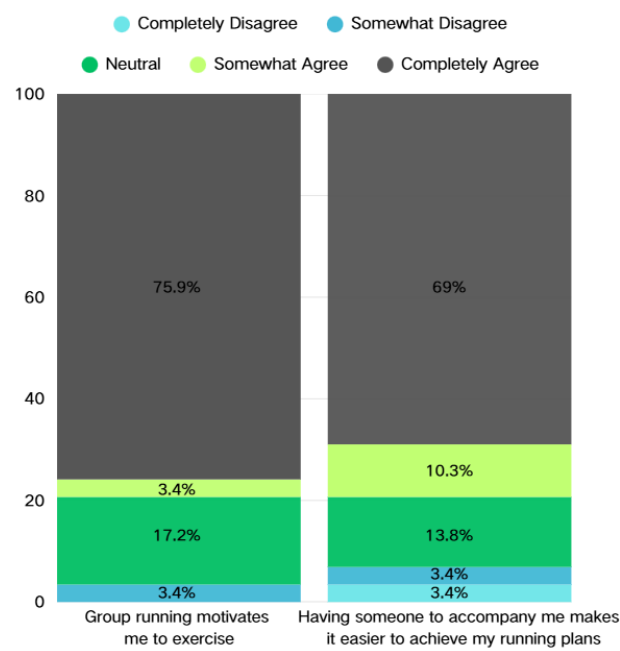
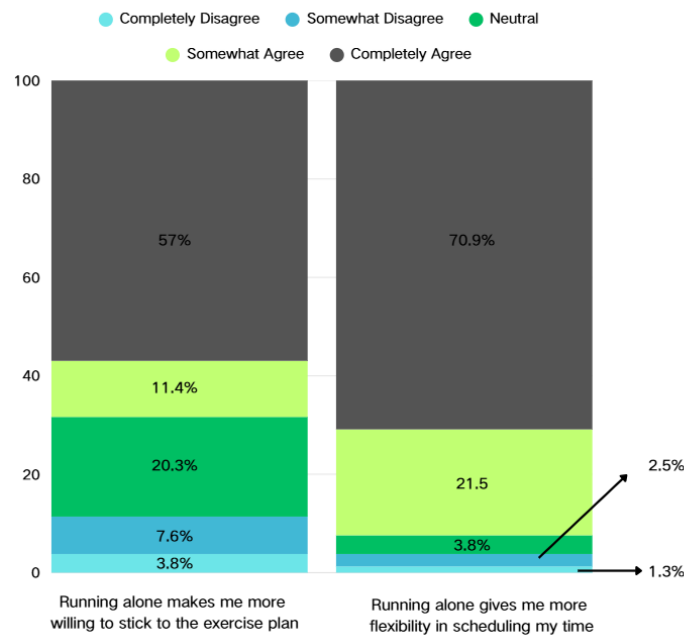


Figure 3: Exercise Intention for Group Running

Further analysis revealed clear differences in the motivation structures between the two running behaviors. As shown in Figure 4, group running relies more on external drivers, with 62.1% of participants selecting "easier to persist/more motivated" as the primary motivation; whereas solo running emphasizes internal control more, with 53.2% of participants preferring solo running because they can "autonomously control intensity." This finding suggests that group running may be more suitable for individuals requiring external incentives, while self-driven runners (e.g., more experienced ones) prefer solo running. This indicates that group running depends more on external incentives, while solo running relies more on internal drive. The results suggest that exercise intention may play a partial mediating role between the two running forms and the alleviation of negative emotion.

Significant differences were also observed in emotional versus practical orientations: group running was more emotionally driven, with 82.8% of participants pursuing a "better atmosphere/more happiness" (as shown in the figure 5), whereas solo running focused more on practical factors, with 84.8% of participants valuing "freer time arrangement." Therefore, group running appears to provide more emotional benefits, while solo running tends to offer practical benefits.

Histogram of Exercise Willingness Scores in Solo Running



Histogram of Exercise Willingness Scores in Solo Running

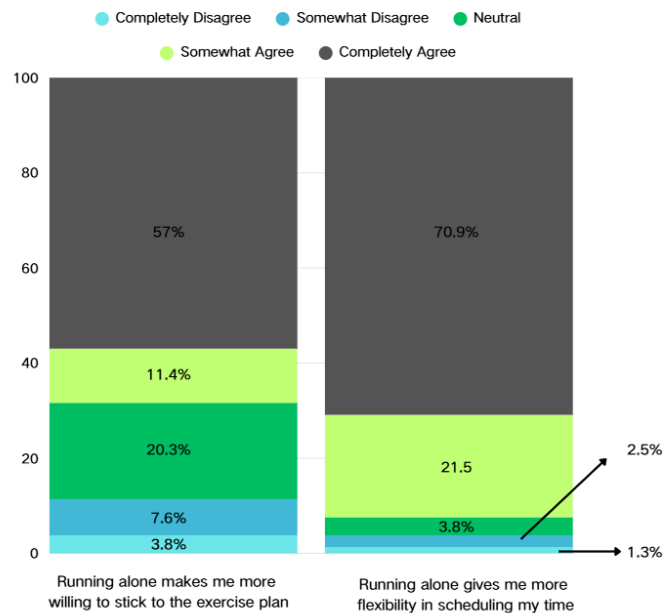


Figure 4: Exercise Intention for Solo Running

Furthermore, attention to skill development was higher in the group environment: as shown in Figure 5, 41.4% of group runners valued "learning techniques/improving performance," while only 6.3% of solo runners focused on "improving personal performance." Interviews with experienced running group members revealed that group running helps individuals focus attention on technical elements such as breathing rhythm, cadence, and stride length; pacing and encouragement from partners also help break through self-imposed limits. Communication and mutual aid during training and long runs can also help individuals recognize others'

strengths and find role models for emotional breakthroughs. In contrast, solo running, lacking real-time feedback mechanisms, may be less associated with performance improvement.

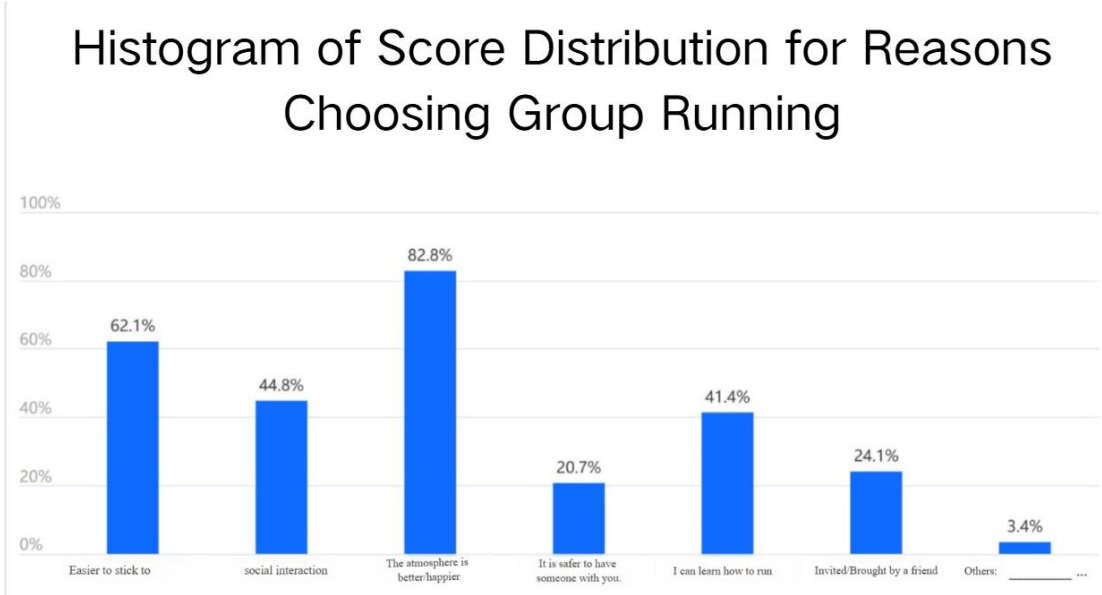


Figure 5: Reasons for Choosing Group Running

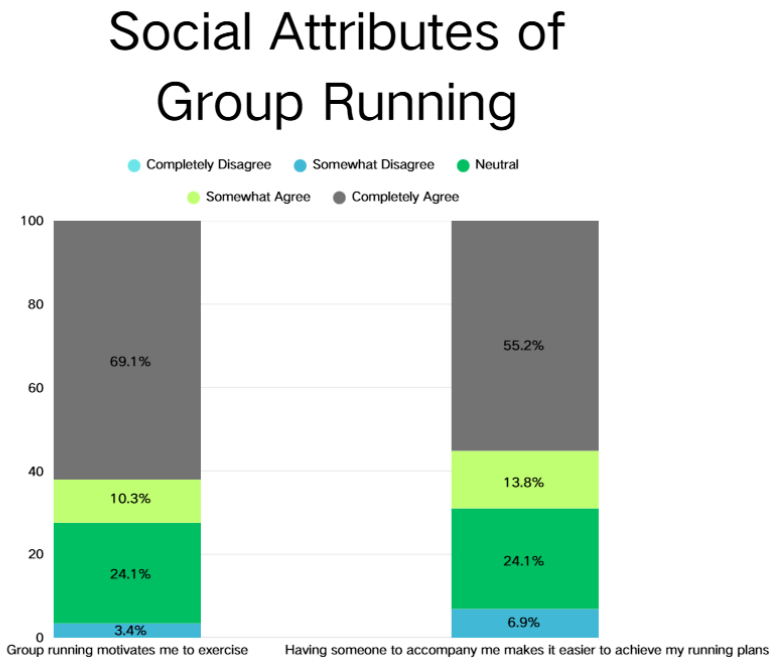


Figure 6: Impact of Social Attributes in Group Running

4.4. Social Attributes as a Key Driver of Group Running

The mental health advantages of group running appear to be largely attributable to its social attributes. As shown in Figure 6, 72.4% of participants highly agreed that "group interaction provides me with emotional support," and 69% highly agreed that "group running enhances my sense of belonging." Interview data also indicated that mutual encouragement and pacing mechanisms within running groups can boost individual confidence and sense of security, thereby alleviating anxiety and loneliness. An experienced member of a running group stated in an interview: "Exchanging pacing duties and mutual encouragement during companion running can enhance emotional mobilization and sense of accomplishment, boosting confidence and security." The interview also mentioned that running group members establish

deep bonds through skill exchange, activity organization, and mutual help, further enhancing team belonging. This suggests that group running satisfies basic social needs, helps individuals integrate into the community, establish identity, and thereby enhances psychological security and counters feelings of alienation. Counselor Wang emphasized in the interview that social support systems are a core resource for coping with psychological distress, and interpersonal interaction—especially with trusted or liked individuals—is crucial for emotion regulation. Therefore, group exercise generally outperforms solo exercise in terms of mental health benefits. Notably, approximately 24.1% of participants selected "neutral" on social attribute items, suggesting that not everyone derives strong social satisfaction from group running, potentially related to individual personality, team nature, or exercise goals. Nonetheless, the social attributes of group running are generally perceived as positive additional benefits.

4.5. Self-Regulation Function of Solo Running Has Significant Effect

Despite the lack of social attributes, solo running remains significantly effective in emotional self-regulation. Data indicated strong participant recognition of its self-regulation function. Responses to the two sub-questions clearly indicated that most participants strongly agreed that solo running has significant self-regulatory function. This data supports the hypothesis that "solo running is a widely recognized and effective method for clearing the mind and promoting psychological clarity." This aligns with theories in sports psychology regarding how exercise (particularly aerobic exercise) can improve cognitive function, reduce rumination, and enhance attention. 87.3% of participants effectively managed their emotions during solo running, clearly recognizing this function. This proportion was even slightly higher than for clearing thoughts. The data also provides strong evidence that solo running is regarded by the vast majority of participants as a core emotion regulation strategy. This corroborates theories on the positive impact of exercise on emotional state, including the release of endorphins, reduction of stress hormones (e.g., cortisol), provision of "psychological space" for reflecting on and processing emotions, and emotional catharsis through physical activity. This indicates that solo running is widely viewed as an important pathway for promoting psychological clarity and emotion regulation, particularly suitable for runners seeking solitude, self-reflection, and cognitive reorganization.

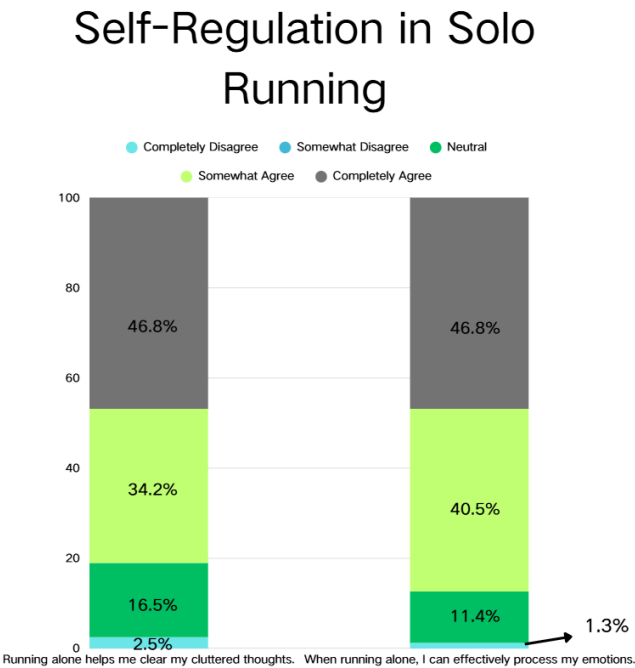


Figure 7: Impact of Self-Regulation in Solo Running

5. Discussion and Conclusion

Both group and solo running effectively improve emotional states but exhibit clear differences in their mechanisms of action and suitable populations. Solo running provides individuals with an introspective space akin to meditation, conducive to enhancing emotional clarity and psychological calmness, particularly suitable for self-driven individuals or those preferring solitude. In contrast, group running demonstrated more prominent effects in alleviating negative emotions, reducing rumination, and enhancing physical and mental satisfaction, supporting the research hypothesis that "group running yields more significant benefits in alleviating depression and internalizing emotions."

The advantages of group running primarily stem from extrinsic motivational factors such as social interaction, peer support, and sense of belonging. These elements not only distract individuals from the discomfort of exercise but also significantly enhance exercise adherence. This study also verified the key mediating roles of exercise intention, health perception, and social attributes between running mode and emotional benefits. Specifically, the mood improvement in group running is more driven by social attributes, relying on external motivation and emotional support to enhance exercise intention and health perception. Solo running, however, relies more on intrinsic motivation mechanisms within exercise intention, such as autonomy, and within health perception, such as self-mastery, possessing unique value particularly in promoting interoceptive awareness and psychological calmness.

However, limitations include a small sample size. Future research could further expand the sample size and employ longitudinal tracking or experimental designs to more robustly verify the mediating mechanisms of motivational pathways. Regarding practical implications, it is recommended to personalize exercise form recommendations based on an individual's motivational traits and emotional needs: individuals requiring social support or external incentives may be more suited to group running; whereas self-driven individuals or those preferring introspection may benefit more from solo running. Furthermore, in practical exercise promotion work, individuals can be encouraged to engage in self-reflection and flexibly combine both running forms based on their personality characteristics, immediate emotional state, and exercise goals to maximize the mental health benefits of exercise.

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