■ Research Article

Social Catalysts and Autonomous Motivation: Peer-Driven Exercise Adherence in a Year-Long University Resistance Training Program

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Abstract: Physical fitness among Japanese university students has declined over recent decades, and rates of sustained physical activity in this population remain low. This qualitative case study examines the experiences of 10 first-year students who took part in a year-long resistance training intervention at a Japanese university. Drawing exclusively on semi-structured exit interviews, we investigated the motivational beliefs, behavioral strategies, and social dynamics shaping sustained exercise engagement. Peer influence was the most prominent driver of adherence in participants' accounts: six of the ten identified a specific "social catalyst," a knowledgeable and committed peer whose presence, encouragement, and practical guidance they described as decisive in overcoming the friction of initiation. Several participants also described, retrospectively, a perceived shift from external regulation toward more autonomous motivation, together with self-reported improvements in nutrition, sleep, mood, and concentration. These shifts were uneven: one participant described a continuing reliance on external structure. The findings extend self-regulated learning theory into physical activity contexts and inform the design of student-centered program frameworks, with particular relevance for Japanese higher education, where campus wellness infrastructure is minimal and informal peer networks carry a substantial motivational burden.

1. INTRODUCTION

University is a liminal period during which many students establish physical activity patterns that persist into adulthood (Kwan et al., 2012; Wei et al., 2011). Yet university students demonstrate low rates of adherence, with only 40-50% meeting exercise guidelines (Keating et al., 2005), and longitudinal studies confirm a significant decline in moderate-to-vigorous physical activity during this period (Aira et al., 2021; Vanhelst et al., 2023).

This decline has been linked to increased academic demands, reduced structured physical education, and competing priorities associated with emerging adulthood (Deliens et al., 2015).

The physical fitness of Japanese university students has declined over recent decades. Shimokado et al. (2013) documented a 26-year decline in physical fitness among Japanese university students alongside changes in body composition, and Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT) data show young adults have lost substantial physical strength over the past six decades (Mainichi Japan, 2020). Compared with international peers, Japanese students lack strength and are more likely to be underweight, a trend that appears to have been exacerbated during the COVID-19 period (Okazaki et al., 2023).

Cultural and institutional factors compound this decline. Academic pressures, part-time employment, and sedentary entertainment options contribute to inactive lifestyles (Tamura et al., 2021). Resistance training remains on the fringe of health-promoting practices, especially among women, where concern about a 'bulky' appearance contributes to avoidance (Roth & Praver, 2025). In Japan, the required first-year Physical Education course tends to function as the *tatemae* (public facade) of physical education, satisfying Ministry requirements rather than providing meaningful instruction (Praver & Roth, 2024). Activity levels among Japanese students have also been reported to decline after the first two years of university, a pattern commonly attributed to the cessation of *bukatsudo* (club activities; Wei et al., 2011). With Japan's aging population driving healthcare costs (Ikegami & Rice, 2023), establishing healthy habits early carries significance beyond individual fitness (Roth & Praver, 2021).

Resistance training offers substantial benefits for university-aged populations: improved physical health, mental well-being, self-efficacy, and academic performance (O'Connor et al., 2010; Radel et al., 2017), reduced depressive symptoms (Gordon et al., 2018), and improved cognitive function (Hillman et al., 2008; Hötting & Röder, 2013). Despite these benefits, participation remains low and dropout rates are high (Sperandei et al., 2016). Prior research has been largely quantitative, with limited qualitative exploration of the motivational and social dynamics shaping sustained engagement, particularly in Japan, where collectivist values, sedentary lifestyles, and socially constructed images of health create a distinct socio-cultural context.

This study addresses this gap by examining the year-long experiences of 10 Japanese university students who participated in a resistance training intervention. Through qualitative interviews, we investigate: (1) the self-regulated learning approaches that influence students' motivation for resistance training, and (2) the strategies students employ to sustain their motivation over time. By situating our analysis within self-regulated learning (SRL) theory, we aim to understand how students navigate the forethought, performance, and self-reflection phases of learning as they develop and maintain exercise habits within the Japanese university context.

2. LITERATURE REVIEW

2.1. Self-Regulated Learning and Motivation in Physical Activity

Self-regulated learning occurs when individuals are 'metacognitively, motivationally, and behaviorally active participants in their own learning and development processes' (Zimmerman, 1989, p. 329). In physical activity, SRL theory frames how individuals set goals, monitor progress, and maintain motivation across the cyclical phases of forethought (task analysis and motivational beliefs), performance (volitional control and self-monitoring), and self-reflection (self-evaluation and affective response) (Panadero, 2017; Zimmerman & Kitsantas, 1997).

Motivation, a central SRL component, exists on a continuum from external regulation to intrinsic motivation (Deci & Ryan, 2000), with autonomous forms linked to greater exercise adherence and well-being (Greene, 2017; Teixeira et al., 2012). Self-Determination Theory posits that satisfying three basic needs (competence, autonomy, and relatedness) facilitates internalization of extrinsic

behaviors into more autonomous regulation (Ryan & Deci, 2017), a lens particularly relevant for understanding how structured exercise interventions foster lasting change.

2.2. Peer Influence and Social Support in Exercise Behavior

Social factors play a crucial role in adopting and maintaining physical activity. Social Cognitive Theory posits that behavior is shaped through mastery experiences, observational learning, social persuasion, and supportive environments (Bandura, 1986). Peer relationships are a salient influence on physical activity from adolescence onward (Fitzgerald et al., 2012), and in university settings students who exercise with friends report greater enjoyment, accountability, and sustained participation (Stevens et al., 2017). Di Bartolomeo and Papa (2019) further found that physically active students exhibited persistent gains in trust and pro-social behavior.

The concept of 'exercise companions' highlights how specific individuals can catalyze physical activity behaviors in others (Rackow et al., 2015), providing both practical support (transportation, workout guidance) and motivational support through encouragement and accountability. Dependence on specific companions may also create vulnerability, however, as their absence can lead to decreased motivation and dropout (Carron et al., 1996).

2.3. The Japanese University Context

Japanese society is generally characterized as collectivist, emphasizing *wa* (group harmony) and interdependent self-construal (Markus & Kitayama, 1991). Such values may amplify peer influence on exercise behavior, since collectivist cultures place greater weight on social expectations (Triandis, 1995). At the same time, cultural norms around appearance for women (Roth & Praver, 2025) and the marginality of gym culture create additional barriers to exercise adoption.

Japanese universities typically lack the campus recreation infrastructure common at Western institutions, and the physical education courses that exist tend to be perfunctory (Praver & Roth, 2024). This gap means students must rely on their own resources to exercise regularly.

2.4. Research Questions

Building on SRL theory and the importance of social influences in exercise behavior, this study addresses two research questions:

RQ1: What self-regulated learning processes shape Japanese university students' motivation to engage in resistance training?

RQ2: What social and behavioral strategies do Japanese university students employ to sustain participation in resistance training over an extended period?

3. METHODS

3.1. Research Design

This qualitative case study employed an interpretivist paradigm (Creswell & Creswell, 2018) to examine students' lived experiences across a year-long resistance training intervention; case study methodology is appropriate for investigating contemporary phenomena where boundaries between phenomenon and context are not clearly evident (Yin, 2003). Two points of clarification are warranted. First, the study reported here is qualitative and draws exclusively on the semi-structured exit interviews described below; no quantitative data were analyzed for this paper. Second, the intervention within which participants were studied was structured as a within-subjects crossover, with participants counterbalanced across required and optional attendance phases (see Table 2). The broader project also collected continuous activity data (Apple Watch), monthly body composition and grip strength, a pre-post well-being inventory, TOEIC scores, and English course grades. Those measures are summarized in Table 2 solely to describe the conditions under which participants' experiences occurred, and they will be reported separately. All findings below therefore rest on participants' interview accounts.

3.2. Context and Setting

The study was conducted at a private Japanese university during the 2025-2026 academic year.

Participants were enrolled in the Faculty of Foreign Studies. The institution provides limited PE programming and lacks a comprehensive campus recreation center.

Student health at this institution mirrors national trends (Praver & Roth, 2022): incoming first-year surveys revealed inconsistent health knowledge, with most students exercising less than they knew advisable, underestimating sleep requirements, and showing uneven nutritional awareness. A subsequent 28-day health awareness challenge confirmed low adherence to physical activity and nutrition guidelines (Roth & Praver, 2023).

3.3. Participants

Ten first-year university students (6 men, 4 women) were recruited through purposive sampling to participate in the year-long resistance training program. All participants were enrolled in the Faculty of Foreign Studies and were studying English as their primary area of concentration. Participants ranged in age from 19 to 20 years and had varying levels of prior exercise experience, from no previous structured training to approximately one year of self-directed gym attendance. Table 1 provides participant demographics. All names are pseudonyms to protect participant confidentiality, and all participants provided written informed consent prior to participation. Ethical approval was obtained from the Research Ethics Committee of Meijo University, Nagoya, Japan (Approval No. 2024-41).

A sample of ten participants was chosen to prioritize longitudinal depth over statistical generalizability (Yin, 2003). Tracking participants across a full academic year produced rich, contextually situated accounts. We do not claim data saturation in the sense used in larger interview studies; with ten participants drawn from a single cohort, saturation in that sense cannot be demonstrated and we make no such claim. The warrant for the sample is instead the depth and duration of engagement within a bounded case (Yin, 2003), and the findings are offered as transferable insights rather than as a saturated account of the phenomenon.

Table 1. *Participant Demographics*

Alias	Gender	Prior Gym Experience	Relevant Experience
Y.M.	M	∼1 year (self-directed)	None
S.A.	M	Some	High school baseball club
F.S.	M	None	High school basketball club
Y.O.	M	None	None
K.I.	M	None	High school baseball club
M.M.	M	Some	High school soccer club
Y.U.	F	None	None
H.S.	F	None	Dance club
Y.H.	F	None	None
N.N.	F	None	None

3.4. Intervention Design

The intervention employed a within-subjects crossover design spanning one full academic year (April 2025 to February 2026; see Table 2 for an overview). Participants were assigned in equal numbers to two counterbalanced sequences. Group A was required to attend a local commercial gym at least twice weekly and to complete a prescribed minimalist resistance training routine during Phase 1 (Semester 1), and then attended at their own discretion during Phase 2 (Semester 2). Group B completed the inverse sequence: optional attendance in Phase 1 and required attendance in Phase 2. Because of this counterbalancing, references below to a participant's "required" or "optional" phase denote that individual's own sequence position rather than a fixed semester.

The resistance training routine reflected evidence-based principles appropriate for novice trainees (Carpinelli & Otto, 1998; Westcott et al., 2001). At the start of their required attendance phase, all subjects participated in an orientation session covering proper exercise form, equipment use, and safety guidelines. The exercise program and data collection methods are detailed in Table 2.

Table 2. *Intervention Design Overview*

	Phase 1 (Semester 1)	**Phase 2 (Semester 2)**
Period	Apr – Aug 2025	Sep 2025 – Feb 2026
Gym attendance	Group A: Required; Group B: Optional	Group A: Optional; Group B: Required
Resistance Training Protocol		
Exercises	Five compound exercises: chest press, row, shoulder press, lat pulldown, leg press	
Sets & repetitions	Two sets per exercise, 8-12 repetitions per set	
Repetition cadence	Controlled tempo (approximately 10 secs per complete repetition) emphasizing proper form and near full range of motion throughout each repetition	
Rest between sets	Approximately 1 minute	
Effort level	Each set taken to momentary muscular failure	
Progressive overload	Weight increased by smallest available increment once participants were able to perform the current load for more than two sets of 12 repetitions with the prescribed cadence and range of motion	
Core work	Swiss ball crunch or back extension (supplementary)	
Step target	8,000 steps/day, continuously tracked via Apple Watch (target informed by Saint-Maurice et al., 2020)	
Data Collection		
Continuous	Apple Watch: daily steps, active energy, exercise minutes	
Monthly	Body composition measurements; grip dynamometry	
Pre & post	Well-being inventory	
Academic	TOEIC scores (June & December 2025); English course grades (4× per semester plus midterm and final)	
Exit Interview	45-minute one-on-one exit interviews (February 2026)	

Note. *Training protocol adapted from Roth & Praver (2025). Participants were counterbalanced across the two attendance sequences (Group A, Required → Optional; Group B, Optional → Required). The measures listed under Data Collection were gathered as part of the broader intervention project; the present paper analyzes only the exit interview data.*

3.5. Qualitative Data Collection

Data were collected through semi-structured exit interviews conducted at the conclusion of the year-long intervention. The interview protocol was informed by the Self-Regulated Learning Interview Schedule (SRLIS), developed by Zimmerman and Pons (1986), which has been validated across multiple educational domains (Cleary & Russo, 2024). The interview guide was adapted to address exercise-specific contexts and comprised 16 questions organized into six sections: 1) Overall Reflection, 2) Structured Gym Period, 3) Free Gym Period, 4) Barriers and Supports, 5) Perceived Effects, 6) Reflection and Future.

All interview questions were provided in both English and Japanese, with participants responding in whichever language they preferred. Interviews were conducted face-to-face, lasted approximately 45 minutes, and were audio-recorded with participant permission. Japanese responses were translated into English and reviewed by the research team.

3.6. Data Analysis

Interview data were analyzed using Layder's (1998) adaptive theory, which integrates deductive and inductive approaches. This methodological framework allowed us to employ SRL theory as an organizing structure while remaining open to emergent themes not anticipated by this orienting theory. Analysis proceeded through coding using NVivo software, and initial codes were derived deductively from SRL theory. Inductive codes emerged through line-by-line analysis of transcripts, identifying concepts and patterns not

captured by the theoretical framework (e.g., managing structural and logistical barriers to exercise adherence, peer dependence, structured-to-free transition experiences).

The researchers independently reviewed coded transcripts, resolving disagreements through discussion. Final themes were organized according to the three SRL phases. Trustworthiness was supported through member checking, prolonged engagement over the full academic year, and thick description of the research context. No quantitative data were coded, tested, or otherwise analyzed for this paper. Where the Results below refer to what a participant did during a given phase, the source is that participant's own interview account rather than an attendance log or device record.

Researcher positionality is acknowledged as a factor shaping data collection and interpretation. The lead author served as both the researcher and one of the instructors involved in the intervention, creating a dual role that may have influenced participants' willingness to share candid reflections. This limitation was mitigated using pseudonyms, assurances of confidentiality, the interview structure of the SRLIS, and the involvement of co-researchers in independent coding and theme validation. The authors' professional backgrounds in EFL instruction and personal training informed their interpretive sensitivities to the academic and exercise-related dimensions of participants' experiences. Several additional safeguards were in place. Participation in the study was voluntary and entirely separate from course assessment: joining, declining, attending, not attending, or withdrawing at any point had no bearing on any participant's grade in any course, and this was stated at recruitment and again before the exit interview. Participants were told they could decline any question or withdraw their data without giving a reason and without consequence. The exit interviews were conducted by the lead author. To reduce the effect of the dual role, the interview schedule followed the SRLIS structure rather than instructor-generated prompts, participants were free to respond in Japanese or English, transcripts were de-identified before coding, and interviews were scheduled after course grades for the year had been finalized. Coding and theme validation were carried out with co-authors who had no instructional relationship with the participants. We nevertheless acknowledge that a power differential of this kind cannot be fully eliminated, and that participants may have framed their accounts more favorably than they otherwise would.

4. RESULTS

Analysis of interview data revealed three major themes corresponding to the phases of self-regulated learning: (1) goal setting as a motivational foundation (forethought phase), (2) peer influence as the primary driver of sustained participation as well as managing structural and logistical barriers (performance phase), and (3) reported shifts toward more autonomous motivation (self-reflection phase). A further theme of holistic lifestyle changes extending beyond exercise also emerged across all phases.

4.1. Forethought Phase: Goals Drive Initial and Sustained Motivation

Participants articulated diverse goals that motivated their participation in the resistance training program. These goals extended beyond physical appearance to include health consciousness, personal accountability, and career preparation. Y.M., who had approximately one year of gym experience from high school, initially began weight training with aesthetic goals, wanting to look stronger, but developed broader health and lifestyle goals over time. He described becoming increasingly attentive to nutrition, deliberately choosing protein-rich foods over low-nutrient instant meals. This attention to diet reflected a goal framework that had expanded from appearance-focused to health-oriented.

S.A. described how his career aspirations motivated his training. As a student hoping to become a pilot, he recognized that physical fitness was a professional requirement: 'Pilots must have a strong body and mind... It's one of my motivations.' Linking exercise to broader life aspirations appeared more durable than appearance-based goals alone.

Together with career aspirations and health

consciousness, exercise motivation was embedded within broader goal hierarchies rather than existing in isolation.

K.I. expressed a similarly expansive goal orientation, noting that the program had 'expanded my potential and the range of what I can do.' His experience also reflected an evolution in how he understood training goals over time: initially believing that machine-based training was too advanced and that bodyweight exercises should come first, he came to understand that 'the choice should be made based on the specific purpose and goals,' reflecting the development of self-regulatory knowledge alongside physical competence (Zimmerman, 1989).

4.2. Performance Phase: Peer Influence as Primary Motivational Driver

The most striking finding from our analysis was the profound influence of specific peers on participants' sustained gym attendance. Six of the ten participants (F.S., Y.O., Y.H., N.N., H.S., and S.A.) spontaneously identified a specific peer as central to their gym attendance. Two of these, F.S. and Y.O., identified Y.M. as essential to their continued participation, describing his presence or absence as the key difference maker with regard to their motivation. F.S. stated explicitly: 'Thanks to [Y.M.], I was able to do my best at the gym, and I was taught a lot of things. If I was with Y.M., I would definitely want to go to the gym... If I couldn't go with Y.M., I wouldn't go.' Y.O. expressed similar sentiments, indicating that Y.M.'s presence was the primary factor determining his own gym attendance.

Y.M. himself demonstrated extraordinary intrinsic motivation, attending almost daily and becoming an informal authority on form and nutrition for the group. His role was *senpai*-like, though all participants were in the same academic year.

This pattern of peer dependence extended beyond Y.M. Y.H. described how a friend 'opened up everything about the gym for me' and provided essential training tips that enabled her continued participation. This was particularly significant for Y.H., who had no prior exercise experience and reported that she 'didn't have any habit to do exercise' before the intervention. Similarly, N.N. cited Y.U. as a source of motivation: 'I want to catch up with her... When I see a friend, I also want to try hard.' For N.N., witnessing a peer's progress created a sense of aspiration rather than competition, a dynamic that might be read in relation to the cultural repertoire of *hagemashiau* (mutual encouragement) rather than individual rivalry, although the interview data do not allow us to establish this as an explanation.

These peer catalyst relationships were also bidirectional. H.S. described how a friend's invitation transformed her mandatory semester: 'NN, she's my friend, asked me to go training together and that makes me very happy to do training and have conversations with her. That was my motivation to do the training in this semester.' Notably, N.N., who described her own motivation as keeping pace with Y.U., was simultaneously a catalyst for H.S., suggesting the role is emergent from relational configurations rather than residing in any individual. Y.O. corroborated a social time-extension effect: solo sessions lasted about an hour, while sessions with peers ran longer as conversation sustained engagement. F.S. captured the essence: what would most help students continue is simply 'a friend to go with.'

S.A. similarly identified a catalyst outside the study group: a senior friend who 'opened up everything about the gym,' shifting him from obligatory to enthusiastic participation. His account indicates that the catalyst role was not confined to the study group.

Across these accounts, certain individuals functioned as what we term 'social catalysts': peers whose presence, knowledge, and encouragement were described by others as necessary for their own sustained engagement. Six of the ten participants described such a figure; the remaining four (Y.M., M.M., K.I., and Y.U.) did not. This influence operated beyond companionship: participants received practical knowledge, emotional support, and accountability. Two participants (F.S. and Y.O.) described the absence of their catalyst as likely to end their own participation, highlighting both the power and the vulnerability of peer-dependent motivation. Both reported at interview

that they had largely stopped attending during their optional phase, which they linked to Y.M. moving to a different gym. These are self-reported accounts; objective attendance records were not analyzed for this paper.

Without the external requirement, attendance became even more dependent on companion availability. Conversely, two participants (Y.M. and S.A.) reported maintaining or increasing their attendance without the requirement, which may suggest that peer dependence diminishes as autonomous motivation develops, though a sample of this size cannot establish that pattern.

4.3. Performance Phase: Managing Structural and Logistical Barriers to Exercise Adherence

Time constraints and logistical barriers consistently shaped participation. Making time for the gym was the difficulty most frequently raised in the interviews, with academic assignments, part-time employment, and extracurricular commitments cited as obstacles.

S.A. described a recurring conflict: 'during the last semester, I felt it was really difficult to go to the gym twice a week and finish assignments.' Physical and logistical barriers compounded these pressures: K.I. noted that 'carrying gym clothes was a burden' on a one-hour commute, Y.U. cited operating hours ('the gym operating time is not available to me… I think being open late would help me'), and N.N. requested locker provision. The off-campus location of the gym was itself a friction point: when asked whether an on-campus facility would make attendance easier, one participant replied directly, 'I want the gym on campus.'

F.S. offered perhaps the most concise articulation of these barriers: 'Once there it was enjoyable; getting there was the problem.' This 'intention-behavior gap' reflects the accumulated weight of structural barriers. K.I. captured the practical response: 'the most important thing is to create an environment where you absolutely do it at a specific time, rather than just doing it when you can.' Together, these observations suggest the gap is driven not by lack of desire but by structural and scheduling constraints requiring deliberate management.

4.4. Self-Reflection Phase: Reported Shifts Toward More Autonomous Motivation

At the exit interview, several participants described in retrospect a shift from external regulation toward more autonomous forms of motivation. Because these accounts were given after the fact, they are best understood as perceived and retrospectively reconstructed shifts rather than as a developmental progression observed prospectively, and they were not uniform across the sample. S.A. articulated this transition most clearly, noting that when attendance requirements were strict, his motivation was paradoxically lower: 'When I was required to go twice a week, my motivation was lower and it was more difficult.' However, when given greater autonomy in deciding whether and when to attend, his intrinsic interest strengthened: 'When I was free to go or not go, that's when I kind of fell in love with going.'

One possible contextual reading is that this observation is notable within a Japanese educational context in which external structures and obligations (*giri*) are often described as playing a strong role in guiding behavior. That reduced external pressure coincided with greater reported enjoyment for this participant is at least consistent with the view that autonomy matters even where compliance with group expectations is valued. This study includes no cross-cultural comparison, however, so such readings are offered as possible interpretations rather than as demonstrated cultural effects.

Y.H. described a similar trajectory, beginning with concerns about fatigue interfering with academic work but developing genuine enjoyment: 'I learned to like exercise... I didn't think my muscles could work hard, but I realized they can be better... I was stronger than I thought.' This discovery fostered intrinsic interest and self-efficacy, a finding of particular interest given continuing concern about physical fitness among female Japanese university students (Hirano & Masukawa, 2011).

Not all participants experienced this motivational shift with equal completeness, however. K.I.

offered a candid counter-perspective: 'I realized I'm the type of person who won't do something unless I'm in an environment where I feel I have to do it.' His broader reflection: 'unless you make time for it as an obligation, people really won't do it' could suggest that for some individuals, structured external requirements may function as an ongoing necessity rather than a temporary scaffold. K.I. reported that his weekly frequency decreased during his optional phase, though he described maintaining engagement across the year. His experience represents an important counterpoint to the autonomy-to-intrinsic-motivation narrative and raises questions about individual differences in self-regulatory orientation that the present sample is too small to resolve.

M.M. articulated a distinct intermediate form of motivation: 'I went to the gym to refresh myself. I don't want to waste my previous efforts.' This sunk-cost reasoning sustained attendance even without external requirements or deep enjoyment, and M.M. also described improving his capacity to manage priorities across gym attendance, academic study, and part-time work.

Participants with prior exercise experience showed different motivational patterns than those new to resistance training. Y.M., who had trained for approximately one year during high school, demonstrated high intrinsic motivation from the outset. In contrast, participants without prior experience underwent more dramatic motivational shifts as they discovered benefits and developed competence. This variation is suggestive rather than conclusive. It raises the possibility that reported motivational change is most consequential for novice exercisers, a question that a larger sample would be needed to address.

4.5. Holistic Lifestyle Changes Beyond Exercise

Participants reported cascading positive changes across multiple life domains as they sustained their resistance training participation. These changes were particularly salient in the areas of nutrition, sleep, mental health, and academic performance. All of the outcomes described in this section are participants' self-reports at the exit interview. No dietary records, sleep measures, mental health instruments, body composition data, TOEIC scores, or course grades were analyzed for this paper, and the accounts below should be read accordingly.

Nutrition. Dietary shifts were among the most commonly reported changes. Y.M. described deliberately choosing protein-rich foods like chicken over the cup ramen and instant foods his classmates ate at lunch. Other participants similarly reported increased protein intake and more thoughtful food choices, a significant departure from eating patterns documented among Japanese university students more broadly (Praver & Roth, 2022).

K.I., whose parents prepared meals at home, noted that the study had made him 'painfully aware that we simply don't eat enough,' prompting requests for more protein-dense foods. N.N. reported being 'able to lift everything at my part-time job that I used to think was heavy,' illustrating the functional utility of resistance training beyond aesthetic goals. She also acknowledged an unintended consequence: treating exercise as license for unrestricted eating, which she reported had increased her body fat, suggesting that explicit nutrition education should accompany training programs from the outset.

Sleep. Improvements in sleep quality were among the most frequently self-reported changes. S.A. explained: 'After the day I went to the gym, I sleep deeply... the quality itself has improved,' with Y.H. and H.S. describing similar experiences.

K.I. described the mechanism in direct terms: 'I go to gym, go home, feel tired, sleep well,' elaborating that he 'fell asleep easily and felt more refreshed,' with the day following exercise feeling 'a bit lighter.' H.S. linked her sleep improvement to emotional regulation, with better sleep increasing the days she felt 'fairly positive.' N.N., having internalized sleep's role in recovery, began going to bed earlier, which improved her classroom attentiveness. These cascading effects (exercise leading to sleep quality improvement, which then enhanced daytime energy and academic engagement) suggest a self-reinforcing feedback mechanism, consistent with research identifying

exercise as a keystone behavior (Duhigg, 2012).

Mental health and stress relief. Mental health benefits emerged as a prominent theme. Y.H. explained that exercise provided an outlet for negative emotions: 'I could target something I don't want to do, something I don't like when I exercise... it was a good reflection... got rid of stress and worry, anxiety.' S.A. noted: 'By going to the gym, I feel refreshed. Even if I have many assignments, I feel relaxed.' And M.M. provided the most direct testimony on the mental health benefits saying, 'I feel like gym makes my heart stronger and makes me feel positive.' These self-reported mental health benefits are consistent with the meta-analytic evidence that resistance training reduces depressive symptoms (Gordon et al., 2018) and are notable against the high international prevalence of mental disorder among college students (Auerbach et al., 2018).

Y.U. described an unexpected benefit: intense physical focus created psychological respite, as 'during focusing on the task at the gym, I could forget the stressful things in daily life.' H.S. described increased psychological flexibility (*yoyu*): consistent training created more mental breathing room, reducing the feeling of being overwhelmed.

Academic performance. Several participants reported perceived improvements in academic performance and focus. Y.H. described improved concentration: 'I could focus. I didn't feel sleepy or bored for the class... New minds come to me.' Y.M. reported that regular training combined with creatine supplementation improved his vocabulary recall in both Japanese and English. While these self-reports require caution in interpretation, they are consistent with research demonstrating that physical exercise improves neuroplasticity and cognitive function (Erickson et al., 2011; Hillman et al., 2008; Hötting & Röder, 2013).

N.N. provided a concrete account of the physical mechanism linking exercise to study: prior to the intervention, her long daily commute left her too fatigued to study upon returning home. Following regular training, she reported that she no longer felt sleepy after commuting and was able to use that time productively. Y.O. drew an explicit connection between improved classroom concentration and language development, observing that 'by being able to concentrate more in class, I think it's also connected to my English ability.' For students in a foreign studies program where sustained attention is integral to language acquisition, this indirect effect on academic outcomes strengthens the case for institutional support.

5. DISCUSSION

Findings reveal three contributions: (1) the emergence of 'social catalyst' individuals as a more powerful motivational force than previously recognized; (2) the significance of structural and logistical barriers to exercise adherence; and (3) participants' retrospective reports of a shift from more controlled toward more autonomous regulation, particularly when autonomy increased.

5.1. Peer Influence as a Primary Driver of Exercise Adherence

Our findings extend research on peer influence by showing the profound impact specific individuals can have as 'social catalysts.' Unlike prior studies documenting general peer support benefits (Rackow et al., 2015), our data show that for six of the ten participants, sustained attendance was described as contingent on a particular peer. F.S.'s statement, 'If I couldn't go with Y.M., I wouldn't go,' exemplifies this dependency, suggesting that for some individuals peer influence may operate not merely as a facilitator but as something closer to a necessary condition for adherence. We advance this as a hypothesis generated by a small bounded case rather than as an established regularity.

One possible contextual explanation is Japan's frequently described collectivist orientation and interdependent self-construal (Markus & Kitayama, 1991). The cultural concepts of *amae* (dependence on others' benevolence) and *wa* (group harmony) offer one vocabulary for describing why peer presence mattered so much to these participants, and are broadly consistent with Triandis's (1995) account of conformity to group norms in

collectivist settings. We stress, however, that this study drew on a single cohort at one Japanese university and included no cross-cultural comparison. These cultural concepts are therefore offered as possible contextual interpretations of what participants described, not as demonstrated causes of their behavior, and the mechanisms the participants actually described (practical guidance, accountability, and companionship) are not specific to Japan.

Effective catalysts showed intrinsic motivation, domain knowledge, and willingness to share expertise. Y.M. exemplified these qualities, aligning with Social Cognitive Theory's emphasis on modeling (Bandura, 1986), though the relationship extended beyond observation to active coaching, emotional support, and accountability. His role resembled an informal *senpai* (senior mentor), despite all participants being in the same year, suggesting that demonstrated commitment and expertise, rather than age, can establish mentorship dynamics.

From an SRL perspective, social catalysts scaffold others' goal setting, strategy selection, progress monitoring, and motivation maintenance, a function particularly important for novices. However, the vulnerability of peer-dependent motivation warrants attention; program designers should help participants develop autonomous motivation alongside peer support, rather than allowing complete dependence on specific individuals.

5.2. Managing Structural and Logistical Barriers to Exercise Adherence

F.S.'s observation that exercise was reliably enjoyable once initiated but consistently difficult to begin captures the structural barriers (time conflicts, off-campus access, equipment transport) shaping many participants' experience.

Competing academic and employment demands were consistently identified as obstacles, compounded by the gym's off-campus location, limited storage, and restricted hours. Adherence may depend as much on reducing logistical friction as on motivational support. Lowering the operational friction of initiating physical activity therefore appears to be an important design consideration.

5.3. Reported Movement Toward More Autonomous Motivation

Participants' reports of movement from controlled toward autonomous motivation are consistent with SDT's proposition that satisfying competence, autonomy, and relatedness facilitates internalization of extrinsic behaviors (Deci & Ryan, 2000). S.A.'s observation that reduced external requirements paradoxically increased his motivation, 'when you were free to go or not go, that's when you kind of fell in love with going' illustrates the potential role of autonomy support. It is, however, a single retrospective account, and K.I.'s contrasting experience shows that the pattern was not general across the sample.

The reported lifestyle changes (improved nutrition, sleep, stress management, and academic performance) appeared to create feedback loops reinforcing exercise motivation, consistent with research on 'keystone habits' (Duhigg, 2012).

5.4. Implications for Practice

Our findings suggest several recommendations for Japanese university physical activity programs.

First, program designers should intentionally facilitate peer networks. Buddy systems, small group assignments, or peer mentoring could help participants connect with motivational anchors; leveraging existing structures such as *zemi* (seminar) groups offers natural frameworks for peer support.

Second, programs should explicitly teach motivational self-regulation strategies, including scheduling gym attendance as a fixed commitment, managing competing demands proactively, and navigating motivational fluctuations.

Third, a phased approach moving from required to recommended to optional attendance may support autonomy development while providing the scaffolding novice exercisers need.

Fourth, programs should help participants recognize the holistic benefits of exercise beyond appearance, framing it as supporting academic and

career success.

5.5. Limitations and Future Research

As a qualitative case study with 10 participants at a single Japanese university, findings may not generalize. The small, self-selected sample and gender distribution (6 men, 4 women) further constrain transferability. Three further limitations warrant emphasis. First, all findings rest on retrospective exit interviews; participants' accounts of how their motivation changed are reconstructions offered at the end of the year rather than observations recorded as change occurred. Second, no quantitative measures were analyzed in this paper, so all reported outcomes in nutrition, sleep, mental health, and academic performance are self-reports and should not be read as objectively verified. Third, the cultural concepts invoked in the Discussion are interpretive resources drawn from the literature rather than variables tested here; with a single cohort at one institution and no comparison group, this study cannot establish that the patterns observed are culturally specific.

Future research should examine peer influence across larger, more diverse samples, investigate support for students lacking social catalysts, and pursue longitudinal and intervention studies of structural supports (on-campus facilities, flexible scheduling, equipment storage) alongside motivational strategies to establish causality.

6. CONCLUSION

This study reveals the interplay of peer influence, motivational evolution, and self-regulatory strategies shaping Japanese university students' engagement with resistance training. The identification of 'social catalysts' (peers whose presence is experienced as essential) highlights both the power and the fragility of peer-dependent motivation in this setting. Structural and logistical barriers represent significant impediments, indicating that program effectiveness depends as much on reducing structural friction as on building intrinsic motivation. Several participants' retrospective reports of movement toward more autonomous motivation, particularly when autonomy support increased, point to the value of program design that scaffolds toward autonomous regulation, while one participant's continued reliance on external structure indicates that this trajectory is not universal.

DATA AVAILABILITY

Due to the qualitative nature of the data and the inclusion of potentially identifiable participant information, the full interview transcripts are not publicly available. De-identified excerpts supporting the findings are included within the manuscript. Additional anonymized data may be made available by the corresponding author upon reasonable request and subject to ethical approval.

USE OF ARTIFICIAL INTELLIGENCE

During the preparation of this manuscript, the authors made limited use of generative AI tools to assist with language editing and formatting. All research design, analysis, and interpretation remain the authors' own, and the authors reviewed the output and take full responsibility for the final content.

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