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Cover Page Footnote

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Constraint-Based Latent Profile Analysis to Investigate the Physical Activity Market Segments Among Chinese College Students

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Abstract

A segmentation study was conducted via constraint-based latent profile analysis (based on a hierarchical model of leisure constraint), focusing on Chinese college students. Multi-profile analysis was done to further compare key determinants (i.e., constraints/motives) of physical activity intention by profile. Three profiles emerged: “body image-conscious physically active,” “noncommittal but achievement-driven,” and “constrained but motivated by enjoyment/socialization.” Each profile reports distinctive patterns in perceived levels of constraints, motives, and intention. Constraints/motives were identified as determinants and varied by profile. Compared to North America, China tends to have more college students seeking physical activity as a task than leisure. Profile-specific marketing strategies are suggested.

Keywords: fitness, international, leisure, motives, socialization

The global physical activity market was estimated at \$738 billion in 2020 (Global Wellness Institute, 2022), which includes fitness, active/sport recreation, and mindful movement as well as associated equipment, technology, and apparel. With the North American market becoming saturated and 70% of the physical activity market lying outside of the continent, North America based companies are eyeing the global market. Particularly, the Chinese market warrants attention as the country with the second largest market (\$109.3 billion; Global Wellness Institute, 2022); it is being actively targeted by companies such as CrossFit, Anytime Fitness, and Lululemon and for drastic and further potential for growth postpandemic (Daxue Consulting, 2022).

Although the physical activity market in China seems to have potential, one group showing discouraging numbers is college students. The percentage of Chinese college students spending at least 150 minutes on moderate-intensity physical activity per week is less than 75%, displaying a downward trend and lower than global standards (see Lin et al., 2022, for a review). For example, more than 80% of college students report spending less than an hour per day in physical activity; this increases to 89.8% for 21-year-old females. As leisure and sport consumption during college years can persist into later life and impose lasting effects, promoting physical activity among Chinese college students is critical for companies to succeed in the market.

For effective promotion, sport managers need a clear understanding of the target population and to develop enticing marketing strategies. College students in China are known to be more self-focused, attentive to self-relevant topics, self-expressive, have their own preferences, and prone to social and peer influences (e.g., J. Kim & Pu, 2022), necessitating the acknowledgement of market heterogeneity and tailored strategies. Market segmentation with Latent Profile Analysis (LPA) can be effective for understanding the market heterogeneity and identifying key market profiles within a population based on set indicators (cf. segment and profile are interchangeably used in this study). Constraints, which are factors hindering leisure participation (e.g., lack of interest, friends, or time), can serve and are known as useful indicators for segmentation (Balaska et al., 2012). Such factors can offer insights on intention formation for physical activity participation.

Focusing on physical activity among Chinese college students, a constraint-based LPA market segmentation is conducted to identify key market profiles and defining characteristics per profile. Further, a multi-profile Structural Equation Modeling (SEM) tests key determinants (i.e., constraints and motives) of physical activity intention per profile to avail practical implications for developing profile-specific marketing strategies.

Theoretical Framework

In the hierarchical model of leisure constraints (see Crawford et al., 1991, for a complete explanation), constraints are determinants of leisure intention/behavior that inhibit/prohibit leisure participation and enjoyment. Leisure participation is decided via the process of forming leisure preference and then converting the preference into behavior. Constraints interrupt the process and can come from intrapersonal (e.g., lack of energy, lack of skill; related to personal psychological state/attributes), interpersonal (e.g., lack of friends; related to social relationships), or structural (e.g., accessibility, time; related to circumstances) factors. Overcoming constraints is essential for a person to engage in leisure.

Motives (e.g., enjoyment, health, social interaction) are what initiate and persist the efforts to overcome constraints and form leisure preference (Jackson et al., 1993). For playing fundamental/significant roles in (non-)participation decision-making, constraints are often employed as indicators/criteria for segmentation in leisure/sport studies (e.g., Balaska et al., 2012). However, there is a paucity of constraint-based segmentation studies delving into physical activity, calling for research. As motives are driving forces of overcoming constraints and thereby significant in forming intention, identifying which motives (as well as constraints) are influential on intention in each constraint-based profile can inform strategies for physical activity promotion.

Methods

Instrument

For rigorous constraint-based LPA and constraint-/motive-based multi-profile SEM, a comprehensive list of constraints/motives that suits our context of interest was compiled. Potential respondents (i.e., college students in China; $n = 35$) were recruited based on convenience sampling and asked to freely list key factors/thoughts affecting their intention for physical activity (i.e., thought-listing process). Collected factors/thoughts ($n = 237$) were coded into various constraints/motives (94.5% interrater reliability). Constraints (i.e., lack of skill, lack of interest, lack of energy, lack of friends, time, cost, safety, weather) and motives (i.e., enjoyment, escape, achievement, health, body image, guilt, social bonding) mentioned by at least 15% of respondents were included in the list. The compiled list aligned with studies on constraints (e.g., Dhurup & Garnett, 2011) and motives (e.g., Lin et al., 2022) for physical activity, and expert review ensured good face/content validity.

Items to measure constraints/motives were developed based on existing scales (e.g., Carroll & Alexandris, 1997; Y. K. Kim & Trail, 2010; Manfredo et al., 1996) or constructed when necessary (i.e., accessibility, safety; see Table 1 for items). Items were 7-point Likert-type or semantic differential scales and prepared in two languages (English and Chinese) based on back-to-back translation. Items for physical activity intention were modified from Cronin et al. (2000), asking the likelihood of meeting WHO's recommendation for physical activity by next year. An online questionnaire was developed including items for screening (2 items; Chinese and college student), constraints (25 items), motives (20 items), physical activity intention (3 items), and demographics (4 items; gender, age, household income, major). With potential respondents recruited via convenience sampling, pilot testing ($n = 86$) checked inter-item/construct correlations and concurrent/predictive validity, and potential respondent reviews ($n = 4$) ensured clarity in survey item/design. After expert consultation, the questionnaire was deemed ready.

Table 1
Measurement Items and CFA Results

Constraints	Items	Est.	AVE	ρ	Motives	Items	Est.	AVE	ρ
Lack of skill	1. Not skilled enough	.86	.80	.93	Enjoyment	1. Enjoyment	.95	.92	.97
	2. Not competent	.93				2. Entertaining	.98		
	3. Difficult	.90				3. Exciting	.95		
Lack of interest	1. Not interested	.97	.91	.97	Escape	1. Escape	.93	.84	.94
	2. Boring	.97				2. Forget about work	.95		
	3. Interested in other activities	.92				3. Diversion	.86		
Lack of energy	1. No energy	.91	.85	.94	Achievement	1. Feel proud	.94	.88	.96
	2. Too exhausting	.93				2. Self-esteem	.96		
	3. Too tired	.92				3. Sense of achievement	.91		
Lack of friends	1. Family not interested	.97	.84	.94	Health	1. Endurance	.95	.90	.97
	2. Friends not interested	.87				2. Strength and fitness	.95		
	3. No one to do with	.91				3. Physical condition	.95		
Accessibility	1. Access to facilities	.91	.80	.93	Body image	1. Body shape	.91	.89	.96
	2. Access to opportunities	.92				2. Weight control	.98		
	3. Accessible	.86				3. Appearance	.94		
Time	1. No time due to work	.96	.85	.94	Guilt	1. Feel guilty	.72	.70	.82
	2. No time due to academics	.92				2. Feel obligated	.94		
	3. No time due to other activities	.88							
Cost	1. Expensive cost	.91	.86	.95	Social bonding	1. Interact with others	.93	.85	.94
	2. Expensive equipment	.96				2. Bond with others	.96		
	3. Expensive leisure	.91				3. Spend time with others	.87		
Safety	1. Dangerous	.92	.85	.92					
	2. Injury risk	.93							
Weather	1. Unpleasant weather	.94	.75	.86					

Data Collection and Analysis

The target population was adult Chinese students attending college in China. Data were collected online through convenience quota (based on gender) sampling by the Chinese market research agency Sojump. A representative sample was recruited (gender: 52.3% male; average age: 20.44; median household income; lies in 50,000–74,999 Chinese Yuan; majors: diverse, less than 10% sport-related), and 398 usable responses were collected after eliminating incomplete or unreliable ones (e.g., completion time was too short, all answers were same).

For data analysis, a confirmatory factor analysis (CFA) tested the instrument's validity and reliability. Constraint-based LPA was conducted. First, the appropriate number of profiles was identified based on various indicators (e.g., AIC, entropy, Lo-Mendell-Rubin likelihood test). Then, respondents were segmented into the identified number of profiles, and each profile was assessed to understand defining characteristics per profile (e.g., constraints, motives, intention). In addition, multi-profile SEM examined key determinants (i.e., constraints and motives) of physical activity intention for each profile, to derive profile-specific practical implications for promoting physical activity and overcoming constraints.

Note. df = degrees of freedom, SRMR = standardized mean squared residual, CFI = comparative fit index, RMSEA = root mean square error of approximation. 90% CI is represented in the parentheses.

Results

Data were screened, and key assumptions were tested. CFA with Satorra-Bentler correction examined the psychometric properties of scales. Measurement model for constraint/motive scales indicated satisfactory fit [$\chi^2/df = 2322.081/825 = 2.81$; CFI = .92; TLI = .90; RMSEA = .07; SRMR = .03] and good convergent validity (e.g., factor loadings greater than .70, AVEs greater than .50), discriminant validity (e.g., AVEs greater than squared inter-construct correlations), and reliability (e.g., composite reliabilities greater than .70; see Table 1).

For constraint-based LPA, the appropriate number of profiles was determined based on (a) AIC, BIC, and adjusted BIC (searching for the “elbow” in plot, where adding more profiles to the model does not yield similar extent of value decrease); (b) entropy (greater than .08 indicates effective partitioning of data); (c) class proportion (greater than 5% indicates meaningful profile size); (d) class probability (greater than 90% indicates accurate class classification), and (e) Lo-Mendell-Rubin likelihood test (examining whether k-class model is superior to k-1 model). Results suggested the 3-profile model (see Table 2). Thus, a 3-profile LPA was conducted with constraints set as indicators, and motives and intention were assessed per profile (see Table 3). Further, multi-profile SEM investigated which constraint/motive had significant influences on physical activity intention within each profile (see Table 3). Based on key findings, each profile is labeled and discussed below.

Table 2

LPA Model Fit by Profile Number

Profile Number	AIC	BIC	Adjusted BIC	Entropy	Class proportion Class probability	Lo-Mendell-Rubin likelihood test
1	13711.775	13783.531	13726.416	1.00	[100] [100]	NA
2	12258.763 ($\Delta 1453.012$)	12370.383 ($\Delta 1413.148$)	12281.538 ($\Delta 1444.878$)	.93	[43.5 / 56.5] [97.7 / 98.0]	2-model better than 1-model at $p < .01$
3	11837.753 ($\Delta 421.010$)	11989.238 ($\Delta 381.145$)	11868.662 ($\Delta 412.876$)	.92	[37.7 / 45.0 / 17.3] [96.6 / 95.5 / 96.2]	3-model better than 2-model at $p = .07^*$
4	11687.555 ($\Delta 150.198$)	11878.904 ($\Delta 110.334$)	11726.598 ($\Delta 142.064$)	.88	[26.9 / 18.8 / 37.5 / 16.8] [89.0 / 95.7 / 94.8 / 93.8]	4-model not better than 3-model ($p = .14$)

* Additional BLRT test indicated that the 3-model was superior to 2-model at $p < .01$.

Table 3

Constraint-Based LPA and Multi-Profile SEM Results

Summary of Results		Constraint-based LPA			Multi-profile SEM (Path: Constraints/motives → Intention)					
		Profile 1	Profile 2	Profile 3	Profile 1		Profile 2		Profile 3	
		Mean	Mean	Mean	Est.	<i>p</i>	Est.	<i>p</i>	Est.	<i>p</i>
Constraint-based LPA	Lack of skill	2.36	4.58	5.31	-.02	.81	.14	.04**	-.09	.42
	Lack of interest	1.69	3.92	5.08	.09	.31	.09	.28	-.17	.23
	Lack of energy	1.95	4.15	5.45	-.11	.23	-.25	<.01**	.06	.59
	Lack of friends	1.95	4.00	5.37	-.07	.43	-.02	.81	.14	.38
	Accessibility	1.60	3.55	5.51	.03	.69	-.17	.03**	.18	.17
	Time	1.93	4.11	5.47	-.13	.08*	.14	.02**	-.04	.68
	Cost	2.91	3.80	5.61	.01	.92	-.06	.35	.09	.58
	Safety	2.51	3.60	5.62	.07	.50	.02	.78	-.10	.56
	Weather	4.95	4.20	5.89	.06	.39	-.07	.19	-.11	.41
Descriptive	Enjoyment	6.04	4.74	5.45	.03	.97	-.10	.38	.33	.02**
Characteristics	Escape	5.67	4.86	5.26	.05	.57	-.03	.82	.22	.12
- Motives	Achievement	6.04	4.86	5.26	.16	.29	.54	<.01**	-.27	.36
- Intention	Health	6.20	5.46	5.40	.09	.37	-.04	.71	-.12	.59
	Body image	6.21	5.28	5.49	.22	.04**	-.10	.27	.21	.42

Profile 1 was “body image-conscious physically active” (37.7%). The profile was the most physically active, as indicated by the highest intention, lowest constraints, and highest motives. Body image (and weight control) was the primary focus of and the defining characteristic for this profile, reporting the highest motive (mean = 6.21) with the strongest positive effect on intention ($\gamma = .22$, $p = .04$). Interestingly, social bonding had a negative influence on intention ($\gamma = -.20$, $p < .01$), serving as a constraint rather than a motive. The social aspects of physical activity were possibly perceived as hindrances in the pursuit of body image and weight control. Lack of time ($\gamma = -.13$, $p = .08$; marginal) was the only constraint with a significant effect on intention.

Profile 2 was labeled “noncommittal but achievement-driven” (45.0%). This profile was noncommittal, as shown in mediocre levels of intention, constraints, and motives. Achievement ($\gamma = .54$, $p < .01$) was the most influential predictor/motive of intention, hinting that the profile may view physical activity as an achievement-oriented activity. Aligning with such conjecture, lack of skill ($\gamma = .14$, $p = .04$) had a positive influence on intention. That is, lack of skill may have turned into an urge to acquire skills (a form of achievement) in this profile, converting the constraint into a motive. The achievement-oriented physical activity was perhaps perceived more as a task than leisure, as implied by guilt ($\gamma = .22$, $p = .01$) also being a significant predictor/motive of intention. Lack of energy ($\gamma = -.25$, $p < .01$) and accessibility ($\gamma = -.17$, $p = .03$) were constraints influential in shaping intention. Time ($\gamma = .14$, $p = .02$) was not much of a constraint in this profile for posing positive influence on intention.

Profile 3 was “constrained but motivated by enjoyment/socialization” (17.3%). This profile faced high constraints but was also highly motivated, reporting high intention. Enjoyment ($\gamma = .33$, $p = .02$) and social bonding ($\gamma = .42$, $p = .02$) were the two determinants/motives for intention. The finding suggests that this profile was more driven by the hedonic and social benefits of physical activity, appreciating the activity as leisure. Notably, despite reporting high levels of constraints, none of the constraints had significant influences on intention. Plausible explanations are (a) high constraints experiencing ceiling effects and resulting in limited influences on intention, (b) motives simply having stronger influences on intention in alignment with prior studies (e.g., Y. K. Kim & Trail, 2010), or (c) a combination of both. Further investigation is required.

Discussion

The current study offered meaningful insights for sport managers interested in expanding to the physical activity market in China. First, the need for market segmentation was demonstrated. Three market profiles were identified for physical activity among Chinese college students, each with distinctive attributes and determinants for intention. Particularly, some factors (e.g., social bonding, lack of skill) served as a motive in one profile and a constraint in another (or vice versa), emphasizing the crucial need for profile-specific strategies for marketing effectiveness/relevance (Armstrong & Kotler, 2005). Second, constraints were verified as a useful segmentation criterion, aligning with prior studies (e.g., Balaska et al., 2012). The perceived degree of constraints mattered more than the constraint-type (i.e., intrapersonal, interpersonal, and structural) in this segmentation. Referring to the hierarchical model of leisure constraints (Crawford et al., 1991), the three profiles were dealing with distinctive issues. Profile 2’s mediocre motives were perhaps not enough to surmount mediocre constraints, Profile 3’s strong constraints were likely

blocking physical activity despite strong motives, and Profile 1 seemed to face no major issue. Third, key constraints/motives for the particular context were identified, including those generally applicable to leisure (e.g., lack of friends, time, escape; Crawford et al., 1991; Manfredo et al., 1996) and physical activity specific ones (e.g., health, body image; Lin et al., 2022). Body image (Profile 1) and guilt (Profile 2) were particularly notable in this context. As discussed earlier, many Chinese college students possibly perceived physical activity more as a task than leisure; this presents valuable insights as such tendency is less prevalent among college students in North America. Last, based on different attributes/determinants per profile, tailored strategies can be suggested for each profile (see below).

As Profile 1 was “body image-conscious physically active,” emphasis on body image (or weight control) benefits of physical activity can be appealing when marketing toward this profile. Offering programs/services that physically (e.g., toning, weight training) and/or psychologically (e.g., positive feedback, promote body appreciation) boost body image should be the key focus. In doing so, caution is required to avoid body shaming and dissatisfaction (Lowery et al., 2005). The social benefits may not appeal to this profile, thus positioning physical activity as an individual leisure may be more effective. With this profile likely being physically active, focus should be more on participant retention than acquisition.

For Profile 2, “noncommittal but achievement-driven,” stimulating the achievement motive would be the key for promoting physical activity. Achievement can be felt from performance-goal achievement (i.e., reaching goals) and/or learning-goal achievement (i.e., making progress; Elliot & Dweck, 1988). Thus, setting achievable yet challenging goals (e.g., improved records, skill mastery), offering positive feedback on the progress, and ensuring recognition of met goals can be recommended. For those who lack skills, promoting physical activity as a way to acquire and learn skills can be effective. Guilt-driven marketing can prompt immediate responses but may have side effects when overused (e.g., self-protection, inaction, stress; Brennan & Binney, 2010). Lack of energy (e.g., adjust activity-intensity, highlight rejuvenating effects) and accessibility (e.g., offer college-run programs, shuttles) are constraints to tackle; time is not much of a concern. This profile may be the least priority for reporting the lowest intention/interest in physical activity.

Profile 3, “constrained but motivated by enjoyment/socialization,” were those triggered by hedonic and social benefits. This profile is distinctive from the other two for perceiving physical activity more as a leisure than task. For hedonic benefits, the experience of flow (i.e., a state of complete concentration that derives strong positive emotions) should be fostered, which can be reached based on skill-challenge balance, intrinsic rewards, being free from self-consciousness, clearly set goals, and immediate feedback (Csikszentmihalyi, 1997). Team-oriented activities (e.g., team sport, group sessions) and associated social benefits can appeal to this profile; facilitating social interactions (e.g., social media, gatherings) can help. Although reporting high levels of constraints, stimulating motives seem more important for this profile as intention was mainly shaped based on motives than constraints.

Conclusion

For sport managers in North America interested in the Chinese physical activity market, this study offered insights by (a) compiling a list of constraints/motives for physical activity among Chinese college students; (b) identifying “body image-conscious physically active,” “noncommittal but achieve-

ment-driven,” and “constrained but motivated by enjoyment/socialization” as the three constraint-based market profiles in the population; and (c) suggesting profile-specific marketing strategies. Compared to North America, China tended to have more college students perceiving physical activity as a task than leisure (Profiles 1 and 2); body image, achievement, and guilt were constraints/motives warranting attention in the profiles.

References

- Armstrong, G., & Kotler, P. (2005). *Marketing: An introduction*. Prentice Hall.
- Balaska, P., Alexandris, K., Kouthouris, C., & Polatidou, P. (2012). An examination of how constraints and processes of change affect stages of behavioural change for recreational sport participation. *International Journal of Sport Management and Marketing*, 12(3–4), 275–293.
- Brennan, L., & Binney, W. (2010). Fear, guilt, and shame appeals in social marketing. *Journal of Business Research*, 63(2), 140–146.
- Carroll, B., & Alexandris, K. (1997). Perception of constraints and strength of motivation: Their relationship to recreational sport participation in Greece. *Journal of Leisure Research*, 29(3), 279–299.
- Crawford, D. W., Jackson, E. L., & Godbey, G. (1991). A hierarchical model of leisure constraints. *Leisure Sciences*, 13(4), 309–320.
- Cronin, J. J., Jr., Brady, M. K., & Hult, G. T. M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing*, 76(2), 193–218.
- Csikszentmihalyi, M. (1997). *Finding flow: The psychology of engagement with everyday life*. Basic Books.
- Daxue Consulting. (2022). How China’s fitness appetite grows as exercising becomes the new lifestyle. <https://daxueconsulting.com/sports-and-fitness-market-in-china/#:~:text=In%202020%2C%20China's%20fitness%20penetration,revenue%20has%20been%20growing%20rapidly>
- Dhurup, M., & Garnett, A. (2011). Self-reported constraints to physical activity participation among university students. *African Journal for Physical Health Education, Recreation and Dance*, 17(2), 86–103.
- Elliott, E. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology*, 54(1), 5–12.
- Global Wellness Institute. (2020). The global wellness economy: Country rankings. https://global-wellnessinstitute.org/wp-content/uploads/2022/02/GWI2022_GlobalWellnessEconomy_CountryRankings_Final.pdf

- Jackson, E. L., Crawford, D. W., & Godbey, G. (1993). Negotiation of leisure constraints. *Leisure Sciences*, 15, 1–11.
- Kim, J., & Pu, H. (2012). I want to vs. I can't: A case study on motives and constraints for Chinese college students attending or media viewing the 2018 Winter Olympics. *Global Sport Business Journal*, 9(1), 11–26.
- Kim, Y. K., & Trail, G. (2010). Constraints and motivators: A new model to explain sport consumer behavior. *Journal of Sport Management*, 24(2), 190–210.
- Lin, B., Teo, E. W., & Yan, T. (2022). Development and validation of Chinese university students' physical activity motivation scale under the constraint of physical education policies. *Frontiers in Psychology*, 13, 722635.
- Lowery, S. E., Kurpius, S. E. R., Befort, C., Blanks, E. H., Sollenberger, S., Foley Nicpon, M., & Huser, L. (2005). Body image, self-esteem, and health-related behaviors among male and female first year college students. *Journal of College Student Development*, 46(6), 612–623.
- Manfredo, M. J., Driver, B. L., & Tarrant, M. A. (1996). Measuring leisure motivation: A meta-analysis of the recreation experience preference scales. *Journal of Leisure Research*, 28(3), 188–213.