THE POSITIVE AND NEGATIVE IMPACT OF ONLINE SOCIAL TIES ON PA BEHAVIOUR: A QUALITATIVE ANALYSIS IN CHINESE ADOLESCENTS

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Article history
Received
December 8, 2024
Received in revised form
September 9, 2025
Accepted
September 27, 2025
Available on-line
September 30, 2025

ABSTRACT

The continuing downward trend in low physical activity levels among Chinese adolescents increases the risk of obesity and negative mood and is associated with poorer mental and physical health. Integrating physical activity within one's social relationships influences physical activity behaviour. Although strong social ties, such as family members, peers, and educators, are influential on adolescents' physical activity, it is also acknowledged that adolescents may build social ties through social media, potentially impacting their physical activity behavior. The current study aimed to gain a deeper understanding of Chinese adolescents' social ties in social media and how this might impact their physical activity behaviour. For this purpose, a qualitative study design was used. We conducted 13 qualitative focus groups that sampled 74 Chinese adolescents. Social support and perceived barriers were identified. Consistent with social ties-related theory (e.g., social integration theory, social engagement theory, etc.), our findings emphasize the need for incorporating the positive influences of strong social ties of peers and parents, as well as weak and peripheral ties of fitness influencers and people from the online PA community with similar PA interests, into the design of social media interventions.

KEYWORDS

Educational process, future teachers, information and communication competence, information and communication technologies, laboratory work, natural sciences

HOW TO CITE

Cui M., Frühauf A., Reimers A. K., Demetriou Y., Krieger C. (2025) 'The Positive and Negative Impact of Online Social Ties on PA Behaviour: A Qualitative Analysis in Chinese Adolescents', *Journal on Efficiency and Responsibility in Education and Science*, vol. 18, no. 3, pp. 219–228. http://dx.doi.org/10.7160/eriesj.2025.180306

Highlights

- *Both offline (parents, peers) and online ties (influencers, communities) significantly shape Chinese adolescents' physical activity.*
- *Positive effects include role modelling, virtual companionship, and competition, which boost exercise motivation.*
- *Negative effects arise from misinformation, online distraction, body image pressure, and gender stereotypes.*
- *Diverse strong and weak ties can provide scalable, low-cost PA support, but safeguards are needed against harmful influences.*

INTRODUCTION

Studies have demonstrated that the majority of Chinese school-aged adolescents have inadequate levels of physical activity (PA) and physical fitness (Chen et al., 2017). There is a general downward trend in PA (Ao et al., 2019) and physical fitness (Dong et al., 2019). A recent study found that only 5.12% of Chinese children and adolescents meet the 24-hour movement guidelines (Chen et al., 2021), while 85.8% of school students engage in leisure sedentary behaviors for longer than 2 hours per day (Song et al., 2019). However, sufficient physical activity (PA) contributes to better overall physical and mental health, physical fitness, and a lower level of obesity in adolescents (Granger et al., 2017). Therefore, it is necessary to increase Chinese adolescents' daily PA.

It is important to know the influencing factors for adolescents' PA behaviour. Adolescent PA is often influenced by socialization and social networking. The significance of social ties' influence on PA has been discussed by numerous scholars. The strength of an interpersonal tie is defined as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual

confiding), and the reciprocal services which characterize the tie" (Granovetter, 1973, p. 1361). Among other social ties, peers, parents, and educators proved to be important influencing factors in adolescents' PA behaviour. Family members and close friends could be referred to as "strong ties", as they are people "one knows well" and usually have a strong emotional bond in the relationship (Gilbert, 2012). Correspondingly, casual acquaintances are referred to as "weak ties" because there is only a weak emotional bond in these relationships. However, it is unlikely that today's adolescents' PA is only influenced by their strong social ties. Nowadays, adolescents' diversity of social ties should also include online connections that have become indispensable for their social relationships. Social media, in particular, has been identified as a powerful tool for reaching, accessing, influencing, and changing PA and diet-related behaviors (Goodyear et al., 2018). Specifically, not only can social media connect adolescents with their offline strong ties, but it can also be an important way to expand adolescent weak ties (i.e., individuals outside the network of close social ties), for instance, to get to know new people online. The weak ties could even include para-social relationships, such as social media fitness influencers. These types of influencers specialize in sharing fitness and food-related content, often associated with objectifying pictures of males and females (Durau et al., 2022; Tiggemann and Zaccardo, 2018). Although para-social relationships usually refer to interactions with a media personality that are perceived to be intimate and authentic (Horton and Wohl, 1956). However, this relationship is also viewed by the literature as gratification for the viewer (Rubin and McHugh, 1987; Horton and Wohl, 1956), which suggests that the one-sidedness of relationships with fitness influencers could be adolescents' weak ties in the online world.

Furthermore, social integration and social engagement theories indicate that diverse social ties show benefits by connecting individuals to resources and activities (Thomas, 2012). Interacting with diverse people entails engaging in diverse behaviours (Litwin and Stoeckel, 2016). In line with these theories, it is expected that peripheral or weak ties expose individuals to novel behaviors and activities (e.g., leisure, volunteer work) that they do not experience with strong ties (Fingerman, 2009), especially those formed through online social networking. Interacting with online peripheral ties and online weak ties could change behavioural patterns. It may have various influences on adolescents' PA, including some influences that adolescents may not experience from merely offline strong social ties. Therefore, it is essential to consider online and social relations.

Social support and stress are key mechanisms through which social ties affect health behaviour (Umberson et al., 2010). While social support includes instrumental (e.g., help with tasks), informational (e.g., advice), and emotional (e.g., a sense that one is loved, cared for, and listened to) support, it has long been highlighted in research on the health benefits of social ties (Taylor and Repetti, 1997). However, social ties also have their negative sides. Stress is a central dimension of the negative side of social ties (Cohen et al., 2004). Stress refers to life disruptions and chronic strains (e.g., ongoing conflict in relationships) that challenge individuals' coping capacities (Pearlin et al., 2005). Importantly, numerous studies have documented that stress, in turn, contributes to poor health habits in adolescence (Kassel et al., 2003). However, these mechanisms are less explored for online social ties' influence on adolescents' PA. A lack of research was especially identified regarding the potential benefits or possible adverse effects of a more diverse online network that includes peripheral or weak social ties on Chinese adolescents' PA behaviour.

Last but not least, existing evidence on adolescents' PA is dominated by Western samples and strong ties (parents/close peers), while studies in Asian contexts rarely disentangle the roles of weak online ties such as influencers or open communities (Engel et al., 2024; Jia et al., 2025; Zhang et al., 2024; Wang et al., 2024). Therefore, to gain a deeper understanding of Chinese adolescents' social ties in social media and how this might impact their PA behaviour positively or negatively, our study explicitly addresses this gap by aiming to map which online agents—across strong and weak ties—shape Chinese adolescents' PA and through which mechanisms. Through exploring this gap, we could also inspire how online social ties may provide lower-cost, scalable support for PA while requiring safeguards against harmful social influences, aiming to improve educational responsibility and efficiency.

METHODS

Participants

We chose a qualitative focus group approach to explore factors that influence opinions, behaviour, or motivation (Krueger, 2014). Eligibility criteria for the group discussion required adolescents to be between the ages of 10 and 19 years (WHO defines 'Adolescents' as individuals in the 10-19 years age group) and living in urban areas, as it is also important to consider the urban-rural disparities in China, including variations in gender and moral norms that can impact access and usage of media technology (McDonald, 2016). Based on these considerations, the first author contacted a high school and a university in Huhhot (a northern urban city in China, Inner Mongolia. There are several reasons for selecting this city. Considering the long period and daily commuting to classrooms for group discussions and research costs, it is more feasible to conduct the research in the city where the first author resides.

Furthermore, it is more likely to obtain permission from school leaders to conduct research with adolescent students, as the first author is more familiar with the teachers from these two schools. To ensure diversity of opinion, we recruited 46 participants between the ages of 14 and 16 as younger adolescents and 28 participants between the ages of 17 and 19 as older adolescents. We also ensured that 37 male students and 37 female students were equally represented.

Procedure

Over four months, starting in March 2021, 14 focus group meetings were conducted with 74 Chinese adolescents.

Each focus group consisted of five to seven participants. Concerning saturation and the stopping rule, data collection continued until codebook stabilization, as no new first-order codes or substantively distinct subthemes emerged over two consecutive focus groups. The researcher therefore decided to stop after 14 groups had been formed. Before each focus group, an explanation of the study's aim was provided, and informed consent (in which participants' anonymity and confidentiality were assured) was signed by each participant and one of their guardians. All participants agreed to participate in the study. Afterwards, all participants were asked to complete a short demographic questionnaire. The average length of each focus group interview was around 30 minutes. The first author independently conducted the coding. To enhance trustworthiness, she engaged in repeated reading and iterative refinement of the codebook until stabilization. Credibility was strengthened through member checks with participants, and dependability was supported by peer-debriefing sessions where preliminary themes were discussed with senior colleagues. NVivo 12 was used to assist in data management and organization.

Interview Guide

Based on the aim of this research, a semi-structured interview guide consisting of seven open-ended questions was designed to ask about participants' experiences with the influences of online social ties on their PA behaviour. The first question aimed to identify general perceived social influences on adolescents' PA behaviour through social media. The following questions were structured in the two overarching themes of social support through social media (e.g, What content or information on social media platforms makes you feel more confident participating in PA?) and perceived stress through social media (e.g, In your opinion, what are the negative influences of using social media on your PA participation?)

Data Analyses

All interviews transcribed verbatim, and data were analyzed following a thematic content analysis in the following steps. Data analysis was undertaken using a computer, but not with a specific computer package. The first author coded the interviews, and the other authors provided feedback on the first author's analysis. We used standard thematic analysis to analyze the transcripts. Thematic analysis is the systematic examination of text by identifying and grouping themes and coding, classifying, and developing categories (Whitley and Crawford, 2005). After creating broad categories based on research objectives and interview notes (categories related to social support and stressful experiences), the primary author coded the transcripts. At this exploratory phase of data coding, initial codes like "informational support", "emotional support", or "a combination of informational support and emotional support" were identified. However, we merged codes once we identified significant conceptual overlap between codes. For instance, we identified substantial patterns of support, including informational and emotional social support through role modeling. In this case, we combined the codes and concepts into sub-themes, such as "informational support and emotional support from role models." And then placed them under the highest category, namely the theme of "social support." As a last step, when writing up the results, quotes were translated into the English language and cross-checked for the accuracy of the translation.

Quality and Rigor

Firstly, member checks, also referred to as 'respondent or participant validation,' are commonly employed as a means of maintaining validity in qualitative research (Creswell and Miller, 2000). This was addressed in the present study by inviting two students who participated in focus group discussions to review the consistency of the themes with their own descriptions and those of their peers' general experiences. Both indicated that the themes identified comply with their living experiences.

Secondly, although the first author completed the coding process independently, all authors participated in and contributed to the identification of the final themes after the first author had completed the initial draft of the identified themes. The final themes presented in this research have undergone multiple rounds of discussion and modification to ensure multiple truths, perspectives, and results in the research process, therefore enhancing the rigour of this research.

RESULTS

Two themes, namely social support and perceived barriers, and five subthemes were generated through the analysis. Within the theme of social support, participants explained how they received useful PA-related information and exercise motivation from both individuals they are related to in offline environments and those they are only connected to through social media. Another aspect, explained in the subtheme 'emotional support and companionship', was the use of competition, virtual companionship, and tracking tools on social media, which motivated them to exercise. Perceived barriers included the distraction of peers through social media, the negative impact of fitness influencers, and the negative influences of online people. See Table 1 for a brief illustration of themes and sub-themes.

Theme	Subtheme	Direction	Tie type	Operational definition	Representative quote	Implication
Positive	Role modelling	+	Strong & weak ties	Observing parents, peers, influencers, or strangers to build self-efficacy	"…I think I can do it as well." (Male, 16)	Beginner micro-vlogs; graduated PA tasks
Positive	Companionship	+	Peers, family, acquaintances	Doing PA together (offline/online) to sustain engagement	"…we feel like we are running together; this is much better than me running alone." (Male, 16)	Real-time buddy features in apps
Positive	Competition	+	Peers, classmates	Step counts or logs stimulate comparison and motivation	"…guys tend to compete for a higher number of steps; they are keen to see who ranked last." (Female, 16)	Gamified challenges with safeguards
Negative	Misinformation	–	Influencers	Unrealistic routines or harmful diets undermine healthy PA	"…I watched many slimming methods… life makes me feel painful." (Female, 16)	Verified creator badges; evidence-based tips
Negative	Distraction	–	Peers/ platforms	Chatting/scrolling displaces PA time	"…then I just don't want to move anymore." (Female, 18)	Focus modes; time-budget prompts
Negative	Appearance focus & stereotyping	–	Online strangers/ communities	Body image pressures and gendered assumptions restrict PA choice	"…sports like skateboarding belong to the male domain, while a female should do yoga." (Female, 18)	Inclusive messaging; de-emphasize appearance metrics

Table 1: Themes, subthemes, directions, tie types, operational definitions, representative quotes, and implications

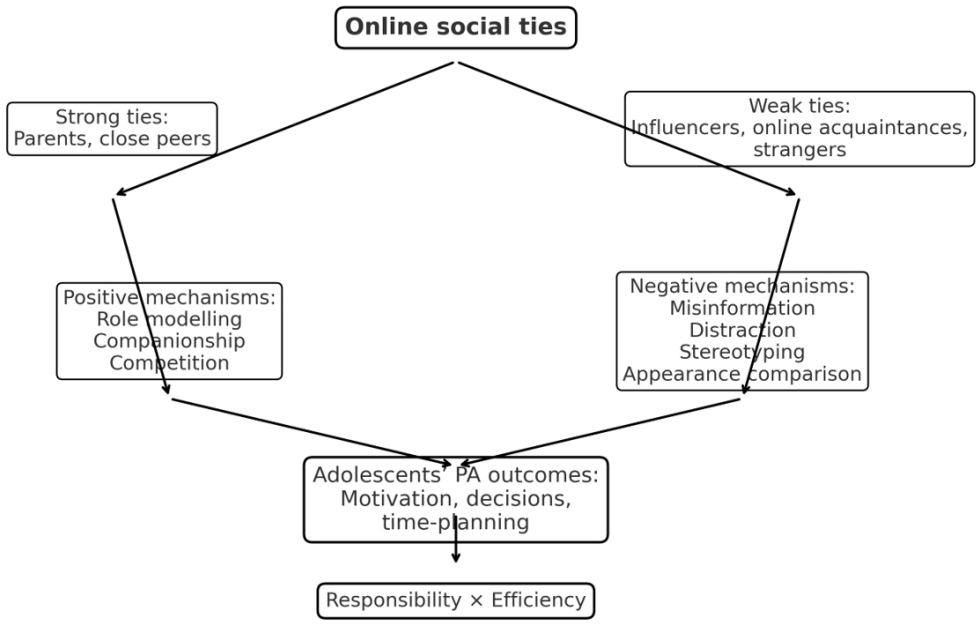

Figure 1: A conceptual model for illustrating the findings

Social Support

Informational Support and Emotional Support from Role Models

The participants identified several persons who influenced their PA behaviour, such as peers, parents, social media influencers, and online friends. The participants described how peers could act as role models through their online social media behaviour. Since they provided guidance, teaching skills, and set good examples in terms of being physically active, participants reported that their peers played a crucial role and helped them both informationally and emotionally. For instance, participants mentioned senior peers from the same school often send them helpful guidance comments: *"From my senior class, I knew some students, they have some advice to help me do some skillful movements in a sport, and usually offer this help through a comment on the sharing posts in my social media account" (Male, 16 years old)*.

Participants further reported feeling more enthusiastic and motivated to engage in PA and wanting to imitate their peers' PA habits when they received videos made by their peers recording positive changes, processes, or results of PA experienced by their peers, as can be seen in the following quotes:

"He lost weight successfully after I watched this comparison in his videos. I feel confident to exercise more, I think I can do it as well" (Male, 16 years old).

"…when I saw a fitness blogger about my age doing push-ups every day, I felt like maybe I could start small too." (Male, 14)

"In videos about my peers, they all look very athletic, energetic, and you want to participate, or you really want to go out and watch them exercising" (Female, 16 years old).

"Sometimes my friends will share some people who play basketball, and they play with nice techniques, that sportive atmosphere makes me want to go out to play basketball now" (Male, 17 years old).

In addition to known offline peers and friends, participants mentioned that online friends, whom they knew from social media, were also supportive informationally and emotionally, as they are usually like-minded people who share uncommon forms of PA interests with participants, as one participant said: *"The sport or PA I'm good at is kickboxing. I would share related content on social media. Then I could receive some suggestions and support from a professional player of a similar age, and they could tell me, for instance, a specific movement I didn't do very well. I speak with them frequently; I think one of them, a girl, my friend, like someone you can meet online for mutual improvement in some skills, but like a friend. I can almost get a personal trainer online; that's what I think I got the most from social media using for PA" (Female, 16 years old).*

Furthermore, participants also reported how they perceived social media influencers as role models. Participants mentioned they appreciated fitness influencers' vlogs (a series of videos being posted under a theme) that present PA achievement, a model for a healthy and active lifestyle, or instructional PA vlogs. For instance, participants noted how influencers helped them gain additional skills through their instructional vlogs that school education usually didn't offer: *"There are a lot of videos that are really funny, like dancing to a pop song, but the influencers change the original moves of the dance of the song into a new series of very simple moves, just for exercising, not for perform on stage, people like me who are not good at dance can follow and train my body, I think these contents are very attractive, which do not usually appear in PE classes"* (Female, 17 years old). Also, the participants stated that they perceive these vlogs to be especially beneficial when they are attempting to learn something new about a sport or PA as a beginner, as can be seen in the following quote.

"You can also search for some basic body movement-related skills you need when you plan to go to the gym daily. You can also see content posted by these influencers, such as videos titled "What should a beginner do when you first go to the gym?" These vlogs are of great help to us, gym beginners" (Male, 16 years old).

Participants also mentioned how fitness influencers not only motivated them to engage in PA but also helped them to plan their day accordingly acting as a practical guide for after-school PA time arrangement, as one participant said: "*Usually I don't know what PA I should do after school before, but when the trend of PA-related influencers starts, and then I start to watch their vlogs, then I start to arrange my time more tightly, and doing a lot of things actively, I think their videos help me to have an active attitude of arrange my time, make me more motivated to become more self-organized, of course, I'm being more physically active than before" (Female, 18 years old).*

Similarly, a female participant talked about the effects the fitness influencers associated with increased PA behaviour and an active lifestyle such as enhanced attitude and mood as can be seen in the following quote, *"When I see the good and positive side that sport brought to the vlogger, for instance, become more optimistic towards life, I will make my decision immediately like I want to be a person like them" (Male, 19 years old).*

At last, some participants mentioned how they perceived their parents as role models who helped them with both their social media presence and exercise-related advice, particularly in relation to their videos. For instance, a female participant said that her father often messaged her with professional pieces of advice: *"My dad will look carefully at my steps (in my video clips), like how I run. He could see my mistake clearer in my videos and would talk to me on social media. My mom helped me shoot these videos" (Female, 16 years old).* Another participant similarly mentioned how her father gave her skill-related advice after watching her badminton videos *"My father is more professional than me in terms of playing badminton usually I will let others shoot a video of me playing badminton and say to my father, especially when I'm a beginner, he will tell me how I should wave the racket because he cannot always by my side watch me play, so I think social media are useful at this time" (Female, 19 years old).*

Companionship and Competition through Online Social Tools

This sub-theme summarizes how participants recognized that social media helped them to achieve mutual companionship for exercising, whether in person or virtually. They found that social media not only allowed them to plan exercises with their friends in person but also provided ways for them to achieve virtual companionship with their peers which were explained in the following quote: *"One of the social media functions I use is running together with both two people turning on voice chat (a function usually embedded within instant messaging) and talking to each other in real-time; we will talk while we run on ourselves in different places, this can actually encourage our physical activity behaviour efficiently. In this way, we feel like we are running together; this is much better than me running alone"*(16 years old, Male).

Participants noted the virtual companionship they experienced through online PA events, which motivated them to engage in PA virtually. For instance, a participant described how other people participating in the online virtual PA community motivated her dedication to PA activities alone:

"People would type things onto the screen like 'this one is difficult, let's do this together,' sometimes when you don't

want to persist when you look at the screen, you will find what people said are actually interesting, then you would persist to the end of the course, and several days after, you will have a very strong sense of achievement, like you finish a thing, a group activity with many people, and they are all strangers actually" (Female, 16 years old).

According to the participants, the online communication between family members about PA also provided a sense of companionship. It positively influenced the family environment regarding sports and PA, as this participant said: *"Usually when I go home after school, or during the weekend, my parents and I will go outside for a while for exercising. During this time, we will use cellphones to record our exercise data, like how many calories we consume, something like that, we will share these records with family members through social media, sometimes I take pictures of my parents exercising and send pictures to my parents on social media, I think we know each other's sport status better in this way, and I think my parents are happy when they see me exercising a lot every day"(Male, 17 years old).*

Participants reported that participating in PA-related online competitions with peers could motivate them to engage in PA on their own during out-of-school time. For instance, participants said sharing personal exercise logs and data (such as running miles, calorie consumption, heartbeat rate, step counts, etc.) on social media can be an exciting and motivating way to initiate and maintain PA behaviour while interacting socially online through competitions, as the following participants described in detail:

"My friend and I would share exercise logs on social media; we would see each other's data every day; I would buy a gift for her if she achieves a certain number. In this way, we can persist in participating in physical activity together" (Female, 18 years old).

"When using step counting apps like Werun, guys tend to compete for a higher number of steps; they are keen to see who ranked last. I think this actually helps them walk more" (Female, 16 years old).

"I know that people in our class often compete for the step numbers; someone even ties their cell phone onto their pet dogs to have more walking step numbers. I think this makes us more active" (Male, 16 years old).

Perceived Barriers

Peer's Distraction

Some participants reported how maintaining and being active in online social relationships could also negatively influence their out-of-school PA motivation, decision-making, and planning. For instance, a few participants noted that spending time online chatting with peers and friends sometimes also decreased their PA as described through the following quotes: "*When my friends send me messages, or share some videos online to me, then I just don't want to move anymore" (Female, 18 years old); "Sometimes when I had the plan to do PA later after school, then my friends send me some funny videos and chatting with me, then I will just chatting with her, and then I miss the time planned for doing PA" (Female, 16 years old). Similarly, another participant added: "I wanted to do some exercising after school, then my friend sent me something online, then I chatted with her, at last, I just forgot that I wanted to do exercise" (Female, 19 years old).*

Negative Impact of Fitness Influencers

Especially older adolescent participants (ages 17-19) emphasized the potential negative influences of fitness influencers. According to them, the primary downside of following social media influencers is that they may promote exercise routines that are not suitable for everyone, potentially causing psychological and physiological harm. *"Generally speaking, social media marketing strategies aim to use a simple way to have a bigger influence. So did the influencers. If you follow their rules, there will only be two possible results. One result is that you may fail to achieve the results described on social media for doing a specific physical activity or sport. That will cause a psychological discrepancy, and you may suspect yourself. Another result is that, if you work out too intensively, it will cause real physical hurt to your body to some extent" (Male, 16 years old).*

Particularly, male participants explained how they were worried that they could not follow the exercise instructions because they were not as well-trained as the fitness influencers: *"I would also think about my personal fitness, like if my body could allow me to do the same sport as the influencers did or not? If I feel this sport is not suitable for me, I will just quit" (Male, 19 years old).*

"You can see a muscle man teaching you what you could do to improve your fitness very often, like doing much intensive exercise. But I think people like me can hardly insist on that amount of exercise every day because I'm not well-trained like him; I will be too tired to follow his steps" (Male, 19 years old).

Some participants specifically pointed out that the instructions of fitness influencers could be problematic and might lead to feelings of stress and anxiety in learning, especially when unhealthy eating recommendations accompany exercise videos. One participant described this experience as follows: *"I watched many slimming methods, like running how many miles every day but only eating cucumber and drinking water; I definitely cannot do that; just imagine that life makes me feel painful; also, I know that method would definitely work" (Female, 16 years old).* As a result of stressful learning, participants mentioned that they gradually lost interest and enjoyment in PA: *"I think it's like the butterfly effect, the more I care about these details and struggle to do perfectly the same as shown in videos, the more I feel anxious and couldn't reach my purpose of doing PA, then sooner or later I would give up" (Male, 17 years old).*

Online People's Stereotyping of Activities, Online Comparison, and Unfriendly Feedback

Participants also expressed the negative impact they experienced from online people on their PA behaviour. They believe that user comments and promoted content can influence one's personal PA choices, decisions, and motivation, as social media appears to be a large community that connects everyone online. Some participants pointed out that promoting appearance comparisons in exercise-related content and stereotyping of certain types of PA based on gender contributed

negatively to the online environment of PA, as the following participant explained:

"I think online people have a strong gender stereotype about PA types. They believe that sports requiring more physical stamina, such as skateboarding, kickboxing, and football, are traditionally considered male-dominated. At the same time, activities such as dancing and yoga are often viewed as more suitable for females. Many people have these opinions, and a lot of people care about this, and this stereotype limits my PA choice" (Female, 18 years old).

Another aspect related to online appearance-related content is the use of filters. One participant reported how the use of filters by social media users bears the risk of unrealistic appearance goals that cannot be reached by exercising only, as she explained in the following:

"People usually post their pictures with filters and make themselves look nicer. Sometimes it can motivate people to focus more on their body image, such as through sports. Still, if this content is too much, I think people like me will not do more sports to become slimmer. Still, I will just try to eat less and less, stay at home, or some girls may go on some medicine for slimming instead of exercising, because it's much easier, compared to exercising for sweating, I think" (Female, 19 years old).

In a similar vein, some participants further mentioned that online comparisons, either in terms of appearance or competition comparisons with other users, made them overlook their initial motivation of PA and could therefore decrease PA enjoyment, as explained in the following two quotes:

"The negative effect of social media is that we may pay too little attention to the essence of doing PA, for instance, why we do PA? We often focus on or pursue something superficial, or we use social media just to compare and compete with others. For instance, we might not appreciate what we have or learn from participating in a sport. Otherwise, we simply want to look better than others on social media" (Male, 16 years old).

"...sometimes I scroll and see girls my age with perfect abs, then I feel bad and don't even want to join PE class." (Female, 15)

"Some people go to the gym but only to take selfies, and don't really do sports or PA I think they will post on social media to get more 'thumbs up' instead of enjoying themselves or wanting to become healthier" (Male, 18 years old).

At last, participants brought up the issue of unfriendly comments about their appearance (haircut, body shape, weight, movement, etc.) from unknown social media users during online interactions. When these comments appeared after the participants posted PA-related content, participants felt that these comments could be a distraction for them from enjoying PA and achieving their goals, as a participant described in detail:

"When I see online people's negative comments about what PA others doing, if that PA is also what I like to do, or similar to my interested PA, those negative comments is a blow to my motivation and confidence, for instance, I like a specific pop dance, then I see on social media about people's comments like, why this dance looks so ugly? If that's some kind of sport that I'm not interested in, I will not care about the negative comments, but I am the kind of person who cares about others' opinions, and I will think about what they said" (Female, 16 years old).

DISCUSSION

The present study provided the first exploration of Chinese adolescents' social ties in social media and how this impacted their PA behaviour positively and negatively. Besides strong ties, such as peers and parents, we found that weak ties, or peripheral ties like fitness influencers and online acquaintances, are also perceived to have both supportive and sabotaging influences. While role modelling, companionship, and competition from them were generally perceived to provide informational and emotional support, fitness influencers, peers, and online individuals were also perceived to influence PA negatively. The importance of this influence was consistent for younger and older adolescents, as well as both genders in this study.

Positive role modelling, companionship, and competition from online social ties emerged as important ways of social support to PA. These three ways of social support have also proven effective in increasing motivation for behaviour change in the PA domain in an offline context, as found in previous research (Sohn and Lee, 2007). This social support found online provided the motivation needed to start PA, in some cases, when participants were sedentary, or helped through informational and emotional support. Therefore, lifestyle interventions that emphasize supportive realities can potentially engage more weak ties in healthier behaviors, especially among adolescents after school or during leisure time. When they are physically apart from their peers and parents, online social ties could play an important role in motivating their PA conduct on their own; however, existing efforts on increasing adolescents' PA behaviour have focused primarily on their offline strong social ties like family and peers.

This study also explained that both types of social ties uniquely had motivating sides for participants with diversified PA. For instance, while fitness influencers could help participants learn certain PA knowledge as a beginner, peers could start competing with participants, e.g., more walking steps. These patterns support the idea that different social ties serve different functions (Fingerman, 2009) and help to explain the benefits of having diverse social ties (both close and peripheral) to psychological and physical well-being.

Researchers argue that a more diverse social network co-occurs with engaging in a greater variety of behaviors throughout the day. Being socially integrated, by definition, means being involved with diverse people engaging in diverse behaviors (Lee et al., 2018). In this study, we found that this engagement and encounter with others occurred in an online environment. It was demonstrated that diverse online social integration and engagement, including both strong and weak ties, could provide participants with more opportunities to be involved in PA when they did not have a partner in the offline world with whom to conduct PA. For instance, attending online training classes with online PA communities was more motivating than attending them alone. Findings from the current study suggest that this virtual PA co-participation with online people may illustrate that this mechanism also exists in online social ties.

In participants' weak ties, social media fitness influencers were identified as role models for PA behaviour. Previous studies of social media fitness influencers have also indicated that they may be an important digital type of health communicator who can influence health behaviors (Pilgrim et al., 2019). While this study indicated that participants mainly received informational and emotional support through role modelling, they also mentioned the influencers' trustworthiness, particularly their source credibility, which appeared to be particularly important for their attitude toward social media fitness. This finding aligns with previous research that identified trustworthiness as a central influencing characteristic (Lou and Yuan, 2019). Although the motivating power of influencers had an impact on the intention to PA, the credibility of fitness influencers remained a concern for participants.

The commercial nature of the PA crash course and the credibility of the fitness influencers participants identified can be related to previous studies about social media literacy. Social media literacy focuses on the interactions among users of social media, whether with friends, peers, or celebrities, as well as developing the skills to examine the messages underlying commercial media advertising, including health and fitness content, seen on social media (McLean et al., 2019). Therefore, although many of the health-focused influencers lack professional accreditation and may post misleading nutrition advice that is not evidence-based (Easton et al., 2018) and therefore may mislead adolescents' PA conduction, it can be seen that adolescents' fitness influencer-related literacy could serve as a buffer for these negative influences.

Participants also expressed concerns about appearance-based online comparisons. For instance, they found that pictures using filters to show unrealistic appearances, along with online appearance comparisons, could make them less focused on enjoying PA and more likely to change their body image through a healthier, dedicated approach, such as doing PA. Indeed, previous research has demonstrated that social media usage is associated with greater body image concerns (Fardouly et al., 2017), while fitspiration content (a portmanteau of the words 'fitness' and 'inspiration'), or appearance-promoting related content has the potential for considerable positive influence on female's health and well-being in terms of promoting exercise engagement, however, it should also consider the potential negative influences. In this study, although participants didn't mention that appearance is the reason for them to exercise, they suggested a relationship between their PA motivation and appearance. In fact, a large proportion of the content promotes exercise to improve appearance (Carrotte et al., 2017). Evidence suggests that young women who use appearance-related reasons as motivation to exercise, rather than health-related reasons, are at an increased risk of body dissatisfaction (Prichard and Tiggemann, 2008).

IMPLICATIONS FOR EDUCATIONAL RESPONSIBILITY AND EFFICIENCY

Our qualitative findings highlight that weak-tie infrastructures (e.g., public influencer content, open fitness communities, app-based challenges) efficiently deliver motivation through role modelling, companionship, and competition. For example, participants described how daily step-count rankings in WeRun or watching influencers' training videos encouraged them to persist with PA despite limited family support. This shows how large-scale, low-cost social cues can extend adolescents' activity beyond immediate strong ties (Jia et al., 2025; Wang et al., 2024). However, our data also reveal clear risks: several adolescents reported exposure to misleading diet routines or appearance-driven comparisons that reduced motivation or caused stress (Engel et al., 2024). Addressing efficiency, therefore, requires responsible design—such as verified expert badges, age-appropriate progression, and algorithmic down-ranking of harmful content (Aschwanden et al., 2024). Furthermore, schools could integrate moderated step-count competitions and buddy tasks to leverage efficient social mechanisms while minimizing harmful comparison (Bull et al., 2020; CDC, 2024). Developers could incorporate features adolescents explicitly valued in our focus groups—such as private feedback loops and real-time companionship—to scale support without amplifying social pressure (Zhang et al., 2024). Policymakers, in turn, should establish responsibility frameworks for platforms hosting adolescent PA content, ensuring alignment with WHO guidelines (Bull et al., 2020). This would allow adolescents to benefit from efficient peer-driven encouragement while being safeguarded against misinformation and negative stereotyping.

STRENGTHS AND LIMITATIONS

This study focused on the perceived impact and subjective experiences of online social ties on participants' PA. It's crucial to note that various factors could impact how individuals perceive the influence of online social ties, such as the number of friends, the level and emotional content of interactions, self-disclosure, communication competence, and social comparison to other users. Moreover, this study only included Chinese adolescents as the research population, which may limit the generalizability of the results to other cultures.

Despite some limitations, this study has several strengths. Firstly, it is among the earliest to investigate the impact of online social ties beyond family and friends. Secondly, we identified social support, as well as in what ways social support was perceived to influence adolescent PA, as well as stress factors. Lastly, this study enriches the understanding of online influencing agents on PA. These influences can be applied and generalized in everyday life, particularly when face-to-face social support is not readily available.

CONCLUSION

These data suggest that multiple social relationships in the online social networking world influence adolescents' PA. Apart from strong ties, online social ties incorporate various weak ties that could also influence adolescents' PA. When designing social media interventions aimed to create an impact on PA, researchers and practitioners should consider the unique roles and interactions of various online social ties. Especially when adolescents lack a partner in the offline world to conduct PA together, the supportive role of virtual companionship was highlighted. This was described as motivating when attending online PA sessions as well as when running alone to connect virtually.

Nevertheless, negative aspects of PA behaviour, such as the stereotyping of activities and the focus on appearance, were mentioned. These aspects could be addressed in adolescents' PE in school. Future research should consider testing the strategies on adolescents' PA behaviour, which were suggested in the present article that addressed multiple ways of social support, for instance, through online role modelling, online companionship, and online competition.

DATA AVAILABILITY STATEMENTS

The datasets analyzed are available in a publicly accessible repository named figshare (https://figshare.com) and can be found here: https://doi.org/10.6084/m9.figshare.24465607.

CONFLICT OF INTEREST

Conflict of interest: *The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.*

AUTHOR CONTRIBUTIONS

MC was responsible for study design, data acquisition and interpretation, and manuscript preparation, and finalised the manuscript. AF and YD made substantial contributions to the manuscript and provided edits. AKR and CK provide valuable feedback, ensuring that the accuracy and integrity of any part of the work are appropriately investigated and resolved. YD approved the final manuscript.

ACKNOWLEDGEMENT

Prof. Victoria Goodyear from the School of Sport, Exercise and Rehabilitation Sciences at the University of Birmingham, Birmingham, UK, also provided us with significant feedback on the revisions of the paper twice. We also thank students, students' guardians, and teachers from Affiliated Middle School to Inner Mongolia Normal University and Inner Mongolia Agricultural University for their agreement and active involvement in data collection.

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