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The influence of motor competence on adolescent identity health: A mixed method study

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Running head: Motor competence on identity health

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Abstract

Our identity develops with age, and many impacting factors will determine whether it is healthy or unhealthy. A particularly fragile phase of identity development occurs during adolescence when level of motor competence may be influential, yet is rarely considered. **Purpose.** The purpose of this study was to examine male and female adolescent's perceptions towards their motor competence and identity development. In-depth information was also collected to understand what factors are important towards identity development during adolescence. **Method.** An explanatory sequential mixed methods study was used to examine the extent motor competence influenced the health of an adolescent's identity. A sample of 160 adolescents (male n = 103, female n = 57, Mage = 14.45 SD = .75) completed the Adolescent Motor Competence Questionnaire (AMCQ) and the Assessment of Identity Development in Adolescence (AIDA). The AMCQ scores were used to group the participants into high (HMC = >83) and low (LMC = < 83) motor competence. **Results.** More females had less-healthy identities than males and those with LMC had less-healthy identities than those with HMC. Subsamples of 17 participants were interviewed in order to explain these results. The most at risk group, females with LMC, identified negative peer comparisons, poor social support and higher stress levels to achieve academic performance as key challenges. **Conclusions.** Well-designed support services for those with LMC, especially for the females should incorporate activities to develop individual competency and close friendships.

Key words:

Adolescents; Health; Physical activity; Psychosocial development

1 Identity is the expression of oneself (Erikson, 1986) and includes personal evaluations of likes and dislikes
2 (Harter, 2012). While definitions of the self and identity are sometimes used interchangeably, they are
3 not synonymous. Identity incorporates aspects outside of the self, including social roles (family, sexual,
4 and cultural), which create a sense of belonging. During adolescence this is dependent on the ability to
5 identify with personally valued life goals (Goth et al., 2012). Consequently identity may range in degree
6 of health and is influenced by many social-emotional, cognitive, physical, and behavioral factors (Goth et
7 al., 2012). Adolescence is the most critical phase for development of a healthy identity as childhood
8 experiences affect later adult roles such as occupation (Erikson, 1968; Harter, 2012; Tatlow-Golden &
9 Guerin, 2017). Over time, identity has been described in many ways, for example, identity styles
10 (Berzonsky, 2011), personality impairments or disorders (Kernberg, 2004) or simply as a social construct
11 (Erikson, 1968). A recent unidimensional theoretical framework proposed by Goth et al. (2012) places
12 identity on a continuum from an integrated, healthy identity to a diffused, less-healthy identity.

13 **Identity Health**

14 During adolescence, identity is molded by an overwhelming plethora of decision-making about future
15 choices such as scholastic opportunities, social engagements, and level of participation in sports or leisure
16 activities (Erikson, 1986; Tatlow-Golden & Guerin, 2017). According to Goth and Schmeck (2018), an
17 integrated, or healthy identity is connected by a strong sense of self, feelings of security, stable thoughts,
18 and a sense of belonging in a social context thereby developing public connectedness (Sollberger, 2013).
19 Consequently, many adolescents who engage in fewer social interactions and experience less social
20 support develop a more fragmented sense of self, which may lead to maladaptive and dysfunctional
21 behaviours, and a less-healthy identity (Goth et al., 2012). Feeling confused about one's future direction,
22 being unable to integrate personal attributes or life goals, or difficulties forming lasting relationships with
23 significant others, may all contribute to poor mental health (Kassin, De Castro, Arango, & Goth, 2013) or

1 even cognitive deficits (Goth et al., 2012). For example, numerous studies have identified psychosocial
2 factors such as level of parental and peer support (McLean & Jennings, 2012), social-emotional factors
3 such as social isolation (Berzonsky 2011; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2010; MacPherson,
4 Kerr, & Stirling, 2016), and physical attributes such as poor body image and being overweight and obese
5 (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008b) that can impact sports participation (Lingam,
6 Novak, Emond, & Coad, 2013) and also contribute to poor mental health. Physical attributes and sports
7 participation are strongly related to level of motor competence yet, its influence on the development of
8 a healthy identity has not been explored.

9 **Motor competence**

10 Motor competence plays an important role in social (Payne, Ward, Turner, Taylor, & Bark, 2013),
11 emotional (Hill, Brown, & Sorgardt, 2011) and behavioural (Green, Baird, & Sugden, 2006) development.
12 It is defined as an individual's ability to perform locomotor, body management, and manipulative tasks
13 proficiently (Gallahue & Ozmun, 2002). Those with high motor competence (HMC) are likely to participate
14 in a wide range of activities which lead to greater social acceptance (Ullrich-French & Smith, 2009), a
15 positive sense of self (Rose, Larkin, Parker, & Hands, 2015) and, potentially, a healthier identity. On the
16 other hand, adolescents with low motor competence (LMC) are less willing to participate in many social
17 and physical opportunities including team sports or school dances (Cairney, Hay, Faught, Mandigo, &
18 Flouris, 2005; Fitzpatrick & Watkinson, 2003; Kirby, Williams, Thomas, & Hill, 2013; O'Dea & Connell, 2016;
19 Payne et al., 2013).

20 LMC also influences self-perceptions across a range of domains (Rose et al., 2015; Skinner & Piek,
21 2001) and contributes to many social-emotional challenges such as social isolation, fewer peer
22 interactions, and social immaturity (Hill et al., 2011; Payne et al., 2013), lower self-worth and higher levels
23 of stress and anxiety (Skinner & Piek 2001; Wilson, Piek, & Kane, 2013) which may influence identity
24 development. This may lead to some developing coping strategies such as avoiding physical activity

1 participation and exposing their physical awkwardness (Fitzpatrick & Watkinson, 2003), difficulty
2 maintaining close relationships (O’Dea & Connell, 2016), devaluing athletic performance (Harter, 2012),
3 being inattentive at school (Harrowell, Hollen, Lingam, & Amond, 2018) or working persistently hard to
4 achieve their goals in other non-physical areas (Missiuna, Moll, King, Law, & King, 2006). Such additional
5 stresses may lead to less peer support, greater internalizing symptoms (Cairney, Rigoli, & Piek, 2013), and
6 poorer mental health (Lingam et al., 2012). Green et al. (2006) found the majority of children with LMC
7 developed emotional difficulties including conduct disorders. Hellgren and colleagues (1994) also found
8 psychiatric conditions (mood disorders in particular) were common among 16-year-olds diagnosed with
9 Deficits in Attention, Motor Control and Perception (DAMP), a synonym for LMC. Such results led Rigoli
10 and Piek (2016) to suggest that screening for psychological difficulties should be included in any research
11 examining motor competence, especially among adolescents as they develop their own sense of self and
12 form an identity separate to their parents. Many authors have examined motor competence in relation
13 to sense of self (Rose, Hands, & Larkin, 2011; Skinner & Piek, 2001), however, only one study has examined
14 the importance of identity among adolescents with LMC (Lingam et al., 2013). Lingam et al. (2013)
15 interviewed 11 adolescents with LMC aged 11-to 16-years and found social networks provided a sense of
16 belonging and contributed to a positive identity. They suggested that adolescents with LMC form their
17 identity differently as they focus on daily struggles and place great importance on how others see them.
18 Therefore, further research investigating motor competence and identity is needed to gain a greater
19 understanding around what factors influence identity development.

20 **Sex differences**

21 It is also important to consider identity development between males and females during adolescence
22 (Sinclair & Carlsson, 2013) as this may be partly driven by their level of participation in physical activity
23 and motor competence (MacPherson et al., 2016). Males in Western cultures, such as Australia
24 experience great pressure to participate in team sports as their social relationships are often driven by

1 physical competition and winning (Cairney, Kwan, Hay, & Faught, 2012). For example, Hands Parker, Rose
2 and Larkin (2015) found that 14-year-old males rated physical activity as important for a chance to
3 compete, win, and spend time with friends. On the other hand, females generally participate in more
4 sedentary cooperative activities such as arts and crafts, place greater importance on developing close
5 friendships, and therefore socialise in more leisure or recreational activities compared to competitive
6 environments (Hands et al., 2015; Perry & Pauletti, 2011). Females participation in physical activity often
7 declines during adolescence (Okely, Booth, & Patterson, 2001) with many benefiting from low intensity
8 activities compared to males (Hands, Parker, Larkin, Cantell, & Rose, 2016). Female adolescents are more
9 likely to question and challenge the development of their identity (Harter, 2012; Goth & Schmeck, 2018),
10 which is influenced by peer acceptance (MacPherson et al., 2016). Therefore it is important to consider
11 gender differences when examining the construct of identity development.

12 Many researchers have examined the social-emotional challenges of LMC (Hill et al., 2011; Payne
13 et al., 2013; Skinner & Piek, 2001; Wilson et al., 2013), however there is limited knowledge about its
14 influence on identity development and motor competence during adolescence. The purpose of this study
15 was to examine adolescent's perceptions towards their identity development and level (high and low) of
16 motor competence and to determine if differences existed between males and females. A secondary aim
17 of this study was to gain an in-depth understanding around what factors are important for identity
18 development during adolescence.

19 **Methods**

20 An explanatory sequential mixed method study (Andrew & Halcomb, 2009) was undertaken to assess
21 motor competence and identity-related perceptions in a sample of adolescents. The first stage involved
22 the collection of quantitative data and the second stage involved qualitative interviews in order to explain
23 and understand the quantitative results. The study was approved by the affiliated Human Research Ethics

1 Committee, Department of Education, and Catholic Education. Written informed consent was obtained
2 from all participants and their parents. This study is a part of the larger who.i.am motor competence
3 project.

4 **Phase one: Quantitative questionnaires**

5 In this phase, adolescents completed two questionnaires measuring motor competence and identity
6 development taking approximately 35 minutes to complete.

7 **Participants**

8 The sample comprised 160 adolescents (64.4% males, $M_{age} = 14.44$ years, $SD = 0.75$). The inclusion criteria
9 were adolescents aged between 12- and 17-years, English as a first language, and no other diagnosed
10 related disability such as muscular dystrophy or cerebral palsy. The age group 12–17 years was selected
11 as these young people could discuss their experiences from both primary and secondary school.

12 **Measures**

13 **Adolescent Motor Competence Questionnaire** (AMCQ; Timler, McIntyre, Cantell, Crawford, & Hands,
14 2016) is a self-report, motor competence questionnaire for adolescents aged between 12- and 18-years.
15 It consists of 26-items covering a range of physical skills and functional tasks. It was informed by the
16 Diagnostic and Statistical Manual of Mental Disorders (fifth edition; DSM-V) criteria for Developmental
17 Coordination Disorder (DCD; American Psychiatric Association [APA], 2013). Participants respond on a 4-
18 point Likert scale of Never (1), Sometimes (2), Frequently (3), and Always (4). To account for response
19 bias, fifteen items are reverse scored. The maximum AMCQ score is 104, with a higher score relating to
20 higher motor competence. A score of 83 or below indicates LMC may be present, further information
21 about the validation of this cut score can be found in Timler et al. (2016). The questionnaire has evidence
22 of concurrent validity against the McCarron Assessment of Neuromuscular Development (MAND;

1 McCarron, 1997; $r = 0.49$, $p < 0.002$), test re-test reliability (intra-class correlation coefficients = 0.96),
2 internal consistency ($\alpha = 0.90$) and can be completed in less than 10 minutes (Timler et al., 2016).

3 **Assessment of Identity Development in Adolescence** (AIDA; Goth et al., 2012; Goth & Schmeck, 2018) is
4 a self-report measure of identity designed for 12- to 18 year-olds. The 58-item questionnaire has a 5 point
5 response format 0 = no (I strongly disagree), 1 = more no (I disagree), 2 = part/part (I neither agree or
6 disagree), 3 = more yes (I agree), and 4 = yes (I strongly agree). An identity score is derived along a
7 continuum of health, with a lower score indicating a healthier identity. The questionnaire has evidence
8 of construct ($r = 0.61\sim 0.80$) and criterion validity ($d = 2.27\sim 2.56$) and internal consistency ($\alpha = 0.73\sim 0.94$;
9 Goth, Foelsch, Schluter-Muller, & Schmeck, 2016). To accommodate for cultural differences, the AIDA
10 was adapted for Australian adolescents (Timler, McIntyre, Hands, & Goth; n.d.). After trialing with a
11 sample of adolescents ($n = 126$) changes were made to some questions. For example the item "*I often*
12 *have a block when I ask myself why I did things*", was changed to: "*I often have a mental blank when I ask*
13 *myself why I did things*" as this was more familiar for Australian boys and girls.

14 **Procedures**

15 Recruitment took place over a two-year period. Hardcopy or online questionnaires (AMCQ and AIDA) and
16 written or online consent forms were distributed to all individuals who agreed to take part in the study.
17 Participants were recruited from a number of locations in order to ensure a range of motor competences.
18 This included recruiting through personal contacts ($n = 6$), an Adolescent Movement Program (AMPitup;
19 $n = 4$) designed for those with a DCD diagnosis, and sporting clubs [Australian Rules Football League (AFL;
20 69 returned/140 distributed), basketball, (7/50) and netball (6/20)]. In addition, a list of schools (34
21 government, 54 independent, and 9 catholic schools) was generated, based on the inclusion criteria.
22 These schools were contacted via email and telephone. Seven independent and five government schools
23 agreed to assist in recruiting participants. The response rate from all of the returned questionnaires was

1 39% (160/415). Although a number of organisations were contacted to help recruit participants, only
2 these clubs mentioned above agreed to participate.

3 **Data Analysis**

4 SPSS version 23 (IBM SPSS Inc., Chicago, IL, USA) was used to analyse the quantitative data. Descriptive
5 statistics were derived for motor competence and identity for the total sample, males and females. The
6 data for the questionnaires (AMCQ and AIDA) demonstrated a normal distribution allowing for parametric
7 tests to be used (Pallant, 2013). The *t*-distributions [$M = 50$ ($SD = 10$)] were derived for the Identity
8 measure. Participants were grouped into high ($n = 108$, males = 80, females = 28) and low ($n = 52$, males
9 = 23, females = 29) motor competence based on their Total AMCQ ($\leq 83 = \text{LMC}$). Two-way ANOVAs (motor
10 competence x sex) were used to examine group differences for the overall Identity measure and one-way
11 ANOVAs were conducted to further examine differences for sex (males and females) and motor
12 competence (high and low) for the Identity measure. Bonferroni post hoc tests were used. Significance
13 was set at $p < .05$.

14 **Results**

15 Descriptive statistics [M (SD)] for age, Total AMCQ, Total and *t*-distribution AIDA are presented for the
16 total sample, high and low motor competence, and males and females (Table 1). Only moderate effect
17 sizes ($> .50 = \text{moderate effect}$; Cohen, 1988) were seen for the AMCQ and AIDA scores between genders.
18 Significant differences in the AMCQ scores were found between those recruited through sporting clubs
19 ($M = 91.75$, $SD = 6.95$) compared to those recruited elsewhere ($M = 82.18$, $SD = 12.57$; $t(138.15) = 6.08$,
20 $p < .001$). Significant differences were also found for the AIDA scores between those recruited through
21 sporting clubs ($M = 57.85$, $SD = 29.02$) and those recruited elsewhere ($M = 82.67$, $SD = 35.42$, $t(157.93) =$
22 -4.8 , $p < .001$). Identity scores were less healthy (higher scores) for females and the LMC group but within
23 a normal range.

1 Two-way (motor competence x sex) ANOVAs revealed significant main effects between males and
2 females for the Identity measure [$F(1, 156) = 11.68, p = .001, \eta^2p = .070$] with a moderate effect size. In
3 all cases, the females had less-healthy identity scores than males (Table 2). Adolescents with LMC scored
4 higher on the AIDA measure (less-healthy) compared to those with HMC [$F(1, 156) = 5.35, p = .022, \eta^2p$
5 $= .033$] with a moderate effect size (Table 1). There were no significant interactions between motor
6 competence and sex. There were no significant differences between AMCQ ($p = .09$) or AIDA ($p = .94$)
7 scores when completed by hardcopy compared to online.

8 Although the two-way ANOVAs revealed no significant interactions between sex and motor
9 competence, when grouped by sex and motor competence (LMC Males, HMC males, LMC females, and
10 HMC females), the Bonferroni post-hoc comparisons revealed significant differences between the LMC
11 females ($M = 92.64, SD = 38.93, p < .001$) and HMC females ($M = 80.75, SD = 33.59, p = .025$) on the Identity
12 measure compared to the HMC males ($M = 59.88, SD = 31.00$). There was no difference between the LMC
13 males ($M = 74.35, SD = 29.29$) and the HMC males ($M = 59.88, SD = 31.00, p = .379$). These results were
14 used to guide the explanatory qualitative phase of the study.

15 **Phase two: Interviews**

16 In this phase, semi-structured interviews were conducted with a subsample of Phase one participants in
17 order to elucidate the quantitative findings. This enabled further exploration of statistical differences
18 between males and females, and used to identify the important influences on healthy identity
19 development, especially for the most at risk group, females with LMC.

20 **Participants**

21 A purposive subsample from a pool of 79 who nominated to participate in this phase were contacted, in
22 order to ensure the cases deemed as information-rich were included (Sandelowski, 2000). Interviews
23 were held four months after the quantitative data were collected. Seventeen interviews were conducted;

1 six one-on-one and five small group semi-structured interviews (four with two participants and one with
2 three participants; response rate = 21.5%). The one-on-one interviews allowed for participants who could
3 not attend a group interview. The small group semi-structured interviews were grouped according to
4 level of motor competence (AMCQ cut score ≤ 83) and sex ($n = 7$ HMC, males = 4; $n = 10$ LMC, males = 6)
5 in order to establish group cohesiveness among the participants. The participants from the interviews are
6 therefore representative of the sample, as the groups were based on their questionnaire results.

7 **Adolescent interviews**

8 The interviews comprised 13 semi-structured questions about family and peer support, environmental
9 stressors, and future planning derived from the Phase one questionnaire responses. For example, one
10 question asked during the interviews was *“Do you feel comfortable talking with your friends?”* which was
11 used to further understand responses to the AIDA questionnaire items such as *“It is difficult for me to be*
12 *together with 2 or 3 friends at the same time, it always causes trouble somehow”* or *“I’m not sure if my*
13 *friends really like me”*.

14 **Procedures**

15 The interviews were held after school and based on participant postcodes for convenience. They lasted
16 between 45 – 90 minutes, were audio recorded, transcribed verbatim, and recruitment continued until
17 saturation was reached and no new themes emerged.

18 **Data Analysis**

19 Data were managed using QSR NVivo 10. The transcribed interviews were analysed using a deductive
20 theoretical approach as the qualitative themes were examined in relation to the identity measure. The
21 Clarke and Braun (2017) procedure for thematic analysis was used to develop a coding scheme, which
22 incorporated three parts: naïve reading, comprehensive interpretation, and structured coding (Creswell
23 & Plano Clark, 2007). Firstly, transcriptions were read repeatedly to ensure familiarity with the text and

1 then open-coding comparing all transcriptions was used to derive themes. The transcriptions were coded
2 line by line to examine if any subthemes emerged. Transcripts were read and coded consecutively by two
3 members of the research team and debriefing was undertaken to resolve any disagreements between the
4 authors ensuring credibility of the results. Evidence of dependability was established as transcripts were
5 read until no new themes emerged. Comparisons between sex and motor competence groups were made
6 using matrix coding and a word frequency to look for transferability of the results.

7 **Results**

8 The participants for the interviews were selected based on their AMCQ scores to represent both high (M
9 = 90.14, $SD = 4.22$) and low ($M = 76$, $SD = 4.60$) competence. The transcriptions were analysed in two
10 stages. In the first stage, open coding and thematic analysis lead to five key themes emerging:
11 Communication, Peer Support, Personal Changes, School Experience, and Planning for the Future. These
12 themes captured the key concepts of identity from the interviewees. In the second stage, responses in
13 each theme were compared between sex and motor competence levels.

14 **Identity development**

15 The quantitative results had revealed differences in identity development between competence and sex
16 groups. The key themes identified by the interviews revealed differences in level of peer and parent
17 support, and sense of self (personal changes). Figure 1 is a word frequency of the adolescents descriptions
18 of identity development, which related to their friendship groups, school and future experiences, and
19 feeling confident within themselves.

20 **Peer support.**

21 Most of the adolescents received support from their peers, however those with HMC had larger social
22 networks (10 to 30 peers) than those with LMC (5 to 10 peers). The males with HMC felt their friends

1 shared in common interests, and developed through sports participation, while females with HMC felt
2 talking to a close friend and being physically active was most important for social acceptance. A 16-year-
3 old HMC female said:

4 Our church has a soccer league I play in. I have, me and my friend who just hang out, but we do physical
5 things, we will sit around and stuff but we like to go out to places and do things that are active.

6 Those with LMC participated in more sedentary activities such as reading, watching television, or playing
7 video games. Most felt less socially accepted and often preferred to work independently to avoid
8 distractions. A 14-year-old LMC male told us:

9 Well these days I do not have really close friends. Last year the friend that I told you about was more so,
10 we were able to talk about something's but I do not think I would ever be fully comfortable talking [with
11 close friends].

12 The females with LMC experienced the greatest difficulty developing social networks as they often had
13 fragmented friendships and lacked trust with their peers. Many experienced negative comments about
14 their poor physical ability in comparison to their peers. The LMC females sometimes acted differently in
15 their friendship groups to avoid conflict, others felt they had drifted apart from friends, and developed new
16 friendship groups. A 15-year-old LMC female shared:

17 Well I moved here at the end of year 4 and I became best friends with this girl. Last year we drifted and
18 now she has moved schools and we do not talk anymore, but there was an incident that happened and
19 that kind of made us grow apart as well, and we have just become different people, learning who we are,
20 what we want in life and so that forced us to drift.

21 In some cases, those with LMC, particularly the males wanted to participate in physical activities so
22 volunteered for sports related tasks such as refereeing. On the other hand, LMC females tended to shy
23 away from competitive sports and preferred to participate in leisure activities such as bike riding and rock
24 climbing. A 15-year-old LMC female explained the difference between sports and leisure activities:

25 I do like some things outdoors but not all, I do not like sports at school but I do like some sporty things like
26 snorkeling and rock climbing rather than soccer and basketball, so I am more outdoorsy than sporty.

27 **School experience.**

1 An adolescent's level of motor competence strongly influenced their school experiences. Many of those
2 with LMC aimed to achieve high grades, participated in a number of extension programs, and placed a lot
3 of pressure on themselves to perform well at school. This sometimes led to them doubting their academic
4 abilities, and developing coping strategies such as completing homework straightaway or spending time
5 absorbed in a book. A 14-year-old LMC female shared that reading, even though time consuming, was a
6 'stress relief.' While, a 15-year-old LMC female voiced her concern about the difference in homework
7 expectations from middle to high school and sought peer support to help her complete tasks. She told us:

8 They are not my friends, but there are two girls who are really clever. They are really smart and they
9 understand everything, so I am always saying "can you please help me with this one?"... With school, the
10 workload is a lot. I am in year 10 and I have exams coming up, so my stress is high because there is a lot
11 of pressure to make sure I get good grades to get into [university]. I am scared of not graduating at all.

12 Most of those with LMC who placed greater value on their academic ability had a positive school
13 experience. For example, a 14-year-old LMC male told us:

14 A lot of my self-worth comes from my intellect, I pride myself on the fact that other people see me as smart
15 and intelligent, as someone that you could come and see if you need help. I am currently at the top of my
16 year for economics, politics and law so I quite enjoy that prestige.

17 While, another 15-year-old LMC female shared:

18 Last year was a struggle for me, but I said over the holidays that this was going to be my year and it has
19 been. [Selecting classes], has made me want to be at school...because [school] makes you do a lot of things
20 that you do not really have interest in. It is a lot better when you get to do what you want to do.

21 The HMC group enjoyed school, placed less academic pressure on themselves, and were more relaxed about
22 completing assessments. Only a 17-year-old male wanting to become a professional athlete felt school
23 was interfering with his future plans. Another 17-year-old HMC male enjoyed after school mentoring
24 sessions and did not worry about the time he spent on homework, he said:

25 I am a mentor. I really like helping other people. So I guess it has given me a lot more confidence in my
26 leadership skills... [it] has shaped who I am... people tell me I should do a bit more [homework] seeing as
27 it is my final year.... I normally do around 2-3 hours a night. People say "you might want to push it up to
28 about four". So I do a bit more, but if it was up to me I would probably just stay with the 2-3 hours.

1 **Teachers.** A teacher's level of support and awareness greatly influenced the adolescents' school
2 experiences. The LMC adolescents respected their teachers but felt uncomfortable talking to them about
3 personal matters. Some females in this group felt their classroom lessons were difficult to understand and
4 developed alternative study methods. A 15-year-old LMC female said:

5 I have a lot of problem with my teachers, some of them are just no good at teaching. I just do not
6 understand the way they teach. With my math and my chemistry teachers I am struggling to understand
7 what they are teaching me. I just go through the text books at home.

8 However, teachers who were aware of their student's co-ordination difficulties and assisted in achieving
9 personal goals made a difference. A 14-year-old LMC female said:

10 I just found that [my year 4 teacher] was really fair because she would always find ways we could improve...
11 because I have Dyspraxia and she knew that I wanted to get my pen license. My hand writing was messy
12 but I really wanted a pen license so I worked really hard and when she saw the improvement, she gave me
13 the pen license.

14 Adolescents with HMC admired their teachers, and felt comfortable with asking for extra advice,
15 particularly if they taught their favorite subject. A 17-year-old HMC male said:

16 Last year my physical education teacher, gave me a lot of advice [when I had my knee operation] and he
17 told me if I wanted to do something in sports, then maybe go into coaching... and coaching is an option
18 that I am looking at right now.

19 **Personal changes.**

20 Many of the adolescents observed different traits of people they admired to help them develop their
21 identity. The LMC females identified the value they placed on personal attributes in order to develop
22 themselves. For example, a 14-year-old LMC female felt reading about different characters helped her to
23 reflect on her own personality. Similarly, a 14-year-old HMC male said:

24 I feel even though I have all of these friends, I absorb a bit of their personality, more so with people that
25 I am impressed with, like I feel I incorporate other people's personality to create my own.

26 An adolescent's willingness to participate in new experiences differed with their level of motor
27 competence. Many of the LMC adolescents were cautious, did not like change, and felt anxious about
28 new responsibilities such as learning to drive a car or finding a part-time job. To cope, many preferred
29 structured activities and avoided unfamiliar situations. A 14-year-old LMC male shared:

1 I am not comfortable going outside of my comfort zone. I prefer to stay with things that are familiar to
2 me... I would try something new if I understood what it was and how to do it... I made a big mistake on
3 school camp a couple of years ago. There was a big 20 meter pole that you had to climb up, which was all
4 rickety and you had to jump up off to the side. You had a harness, but you felt like you did not have one.
5 I decided to go first to get it over with and it was absolutely terrifying. I am never EVER doing something
6 like that again... I definitely have limited comfort zones and I know what they.

7 The adolescents with HMC felt they were becoming more mature as they embraced their new found sense
8 of responsibility and independence. A 14-year-old HMC male said:

9 I feel like I am getting more mature and being less silly. I look back on myself 11 years or younger with
10 extreme embarrassment of who I was then, I use to not like school and I just wanted to go off and do my
11 own thing.

12 **Planning for the future.**

13 Planning for the future became more important with age, and males and females used different strategies
14 to work towards their goals. Most females valued high organisational skills. A 15-year-old HMC female
15 said her busy school and dancing schedules lead to her consciously managing her time effectively.
16 However, some LMC females procrastinated as they were fearful of not achieving their goals. A 14-year-
17 old LMC female explained how her future goals made her feel:

18 I definitely think about my future a lot, I try to place myself in the future and see how I can get there... if it
19 does not scare you then it does not make you stronger... with acting, in three years' time I am scared about
20 what is going to happen and that drives me when I compare it to math [teaching]. I am not as scared.

21 Males were less stressed about their future, more driven by their occupational goals, and knew their next
22 step (attending university). Some put greater consideration into their future goals than others, as a 14-year-
23 old HMC male said:

24 In the future you are going to be looking back at what you are doing today and think was that getting me
25 near to where I am now, or has it gotten me there faster? Yeah so, that is a motivating factor but I do not
26 think about [responsibility], I tend to think about what experiences am I going to have in the future, am I
27 going to be a CEO...

28 **Communication.**

29 **Parent support.** The females with LMC sought more advice from their parents, especially their mothers,
30 compared to their peers or other adults. In comparison, the HMC group felt anxious about disappointing

1 their parents so they often sought advice from others such as relatives or friends before consulting with
2 their parents. A 17-year-old HMC male said:

3 I am most comfortable talking with my friend's mom because the first time I met her she gave me and her
4 son lectures about what to do as teenagers. I know that when she talked to me and him about it, I knew I
5 would be able to talk to her about similar stuff... If I have a problem that I am not comfortable talking to
6 my parents about, then I talk to her and she will give me some advice on it.

7 Males were more open about sharing their plans for their future with their parents, than females. Only
8 the 17-year-old athlete felt uncomfortable sharing his plans for becoming a professional athlete because
9 his parents wanted him to go to university. The males felt supported as they were encouraged to focus
10 on their schooling rather than part-time employment. A 14-year-old HMC male reflected on his future:

11 I have talked to my parents about [Engineering] quite a bit because my dad is an engineer so he knows
12 quite a bit about process, flow... and he is supportive of my ideas.

13 Whilst another 14-year-old LMC male felt his father encouraged his future plans. He said:

14 [My father] really wants me to do engineering because I am alright at maths, I am in the top year 10 class,
15 and that is something you need for engineering so he thought that is something that I can pursue.

16 **Siblings.** Siblings provided additional support and guidance towards future goals. The greatest
17 differences were reported among the LMC females and the HMC males. The HMC males were inspired
18 by their siblings, as a 17-year-old said:

19 My older brother, he would have liked to have gone to university, but did not get the right score, but he
20 got into [college], and now he is doing web design. So [my parents] are really happy that he did not sit
21 around after [school], he actually did something. They would not mind if I did not make it [to university]
22 either, as long as I try to do what I want to do.

23 In contrast, the LMC females felt they had to work persistently hard to achieve similar results to their
24 siblings. A 14-year-old LMC female felt nervous about her future after seeing her brother negotiate his
25 with ease. She told us:

26 My older brother is finishing school this year and he is really calm about it, but you have to do a lot of stuff
27 once you finish school because that is when you apply for universities. I know you can try again but... he
28 is really relaxed about it. That freaks me out, because this year he decided what he wanted to do and I
29 find it really difficult to understand...

1 In conclusion, the interviews helped to explain the group differences between sex and motor competence
2 identified in the questionnaires. Overall the HMC males were relaxed about their future, while the HMC
3 females experienced some challenges towards their identity. The LMC males either found ways to
4 participate in physical activities, or discounted the importance of physical activity and focused on other areas
5 such as academic performance. Females had a lower sense of belonging compared to males, regardless
6 of their level of motor competence. This appeared to be driven by their peer and parental support and
7 ability to make future plans. Overall, the LMC females experienced less healthy identities, which may be
8 related to the perception of themselves, ability to reach their future goals, and their fragmented friendships.

9 **Discussion**

10 Identity health was lower in the LMC group than in the HMC group and in females than in males. Peer
11 and parent support, supportive environments, open communication and ability to plan for the future
12 affected an adolescent's identity health in different ways. Some of these positive influences, apart from
13 parent support were lacking for the females, especially those with LMC.

14 **Motor competence**

15 Those with HMC were more likely to have a healthier identity as they had more positive experiences such
16 as their involvement in sports. Participation in weekend and after school sports, particularly team sports,
17 is a primary form of socialisation for this age and leads to stronger social relationships, self-confidence,
18 and a healthier identity (Goth et al., 2012; Jung, Pick, Schluter-Muller, Schmeck, & Goth 2013). Further,
19 Ullrich-French and Smith (2009) found that adolescents with HMC were more likely to continue to
20 participate in their soccer team if they had positive relationships with parents as well as their peers.

21 The LMC group participated in more sedentary activities such as video games, and were less
22 motivated to participate in physical activities unless they received additional encouragement from
23 significant others that created a supportive environment for them to participate. This was not surprising

1 given that lower participation in physical activity has previously been linked to poor peer support (Hill et
2 al., 2011), lower self-efficacy towards physical play (Cairney et al., 2005; Wilson et al., 2013), a preference
3 to participate in more sedentary leisure activities (Rivilis et al., 2012), lower motivation to participate in
4 sports (Bardid et al., 2016) and lower perceptions of actual and perceived motor competence (Barnett,
5 Morgan, van Beurden, & Beard, 2008a; Stodden et al., 2008). Teenagers with LMC were more likely to
6 engage in physical activities if they received encouragement from their parents and peers, and were able
7 to access recreation and exercise programs (Barnett, Dawes, & Wilmut, 2013). Lingam et al. (2013) found
8 those with LMC often developed their sense of belonging through their close friends who valued their
9 similarities and differences. Many felt attributes such as being funny, reliable, and trustworthy
10 contributed to this sense of belonging.

11 The LMC group also reported greater levels of stress about new responsibilities such as learning to
12 drive a car and achieving academic goals compared to the HMC group. Other researchers have identified
13 that adolescents with LMC have difficulty completing household chores, maintaining close
14 relationships (O’Dea & Connell, 2016), reading, communicating, and are often inattentive at school
15 (Harrowell et al., 2018). Their preference for avoiding unfamiliar situations and high stress levels
16 regarding achievement of their goals, appears to lead to coping strategies such as distancing or
17 avoidance. Similarly, Lingam et al. (2013) found adolescents who experienced difficulties in school tasks
18 such as handwriting, developed strategies to overcome their future challenges, and valued teachers who
19 understood their needs. Consequences of avoiding situations may be a less organised sense of self
20 (Berzonsky, 2011; Bosch & Card, 2012), and lower self-esteem (Goth et al., 2012; Jung et al., 2013).
21 Lingam et al. (2013) also suggested those with LMC placed greater importance on small victories,
22 being positive, but also relied on their parents to assist with daily activities which improved their sense
23 of identity and ability to complete tasks. In this study, sense of self fluctuated in LMC adolescents

1 which was based on their ability to accomplish tasks such as school assignments, studying for exams,
2 and the level of support they received from their teachers and parents.

3 **Sex differences**

4 Males in this study had healthier identities than the females. They reported less stress about their future,
5 recognised a high level of maturity, felt they were experiencing greater independence and participated in
6 aged appropriate activities such as team sports. Klimstra et al. (2010) also found that maturity contributed
7 to a stable identity in male adolescents, as they were more confident to reconsider alternative
8 responsibilities. Males were more likely to be involved in sports regardless of their level of motor
9 competence, a finding also reported by Cairney et al. (2012). This could be related to parents having a
10 greater awareness of their son's physical capabilities which may influence their decision to participate in
11 sport (Timler, McIntyre, & Hands, 2018). Greater importance is often placed on participation by males
12 (Hands et al., 2015). In addition, the way the media portrays athletes privileging males over females, and
13 the subsequent messages, may influence male and female sports participation differently (Angelini, 2008).

14 Overall the females placed greater emphasis on organisational skills to achieve their future goals in
15 this study. The pressure to obtain high academic scores combined with an unwillingness to share future
16 plans with their parents may be contributors to their less-healthy identity scores. Harter (2012) found
17 identity exploration was more complex for females than males, as they used a wider number of settings
18 to establish their identities. Females in this study participated in a wide range of activities and therefore
19 experienced many fluctuations in their sense of self, which were influenced by their level of social
20 acceptance and number of close friendships. In other words, healthy identity development was not linked
21 to participation in physical activities but more closely related to level of peer support. Female adolescents
22 highly value the quality of their friendship groups, which are generally small. On the other hand, males
23 aspired to more friends and larger social networks (Demir & Urberg, 2004). A female's sense of belonging

1 was heavily influenced by peer comparisons and self-image. Sinclair and Carlsson (2013) also found that
2 participation in more sedentary activities, consideration of employment opportunities and society driven
3 gender roles were major influences on the healthy identity development of females.

4 The less-healthy identity development of the females in this study compared to the males was a
5 surprising finding. In many other studies, male adolescents were a higher risk group for mental health
6 issues (Vanello et al., 2008). For example, Berzonsky (2011) found a higher proportion of males than
7 females with less-healthy, diffused identities. However, depression, eating disorders and self-injuries (e.g.
8 cutting) are more common among females as they are more vulnerable to depressive thoughts, self-
9 blaming, poor body image, and negative social comparisons (Klostermann, Connell, & Stormshak, 2016;
10 Perry & Pauletti, 2011). Further research investigating the influence of social and cultural norms,
11 technology and media on an adolescent's identity development is needed, in particular how this might
12 differ between males and females.

13 **Sex and Motor Competence**

14 The females with LMC were the most at risk group as they placed great stress on themselves to perform
15 well at school, experienced many negative judgements about their physical ability and consequently
16 compared themselves unfavourably to their siblings or peers. They experienced many self-doubts about
17 their personal attributes, were concerned about achieving their future goals, and tended to seek advice
18 from their parents rather than their peers. Viholainen and colleagues (2014) found poor motor skills in
19 female adolescents were associated with a lower psychosocial well-being and higher conduct problems,
20 hyperactivity and emotional problems. They also found that level of motor skills mediated a female's self-
21 concept about school-related activities such as math, language studies and physical education classes. For
22 example, those with good motor skills also reported that they did well in physical education classes and
23 had strong peer support and less emotional problems (Viholainen et al., 2014). Harrowell, Hollen, Lingam,

1 and Emond (2017) found female adolescents with LMC were more prone to mental health difficulties and
2 poor peer relations compared to the males. In this study, some successful coping strategies such as
3 completing homework straight away, and reading as a means of escape was reported by the LMC females.

4 Interestingly, identity development of the males with LMC was healthier compared to the LMC
5 females. One explanation is that males with LMC found ways to participate in physical activities
6 (compared to the females with LMC) for example by refereeing or scoring. As noted above, this is an
7 important avenue for social support during this age. Cairney et al. (2012) also found LMC males aged 9-
8 to 13-years participated in more active play than LMC females. Engagement in organised physical
9 activities with peers builds resiliency (Cairney et al., 2005; Zimmerman et al., 2013) which is important
10 during adolescence to develop a stronger sense of self and to regroup after negative experiences. Similar
11 to Harter (2012), the males who did not participate in physical activities devalued the importance of motor
12 skills and focused on other areas such as academic competence. The males with LMC also openly
13 discussed their future plans with parents and significant others which helped them form stronger
14 interpersonal relationships (Goth et al., 2012), a more positive sense of self, and sense of belonging to a
15 social network (Harter, 2012). As females were more focused on close friendships, those with LMC
16 experienced a double disadvantage due to their less-healthy identity development and level of motor
17 competence. They avoided participating in many activities with their peers despite their desire to develop
18 supportive social networks. It is not clear from the interviews, other than the reporting of positive coping
19 strategies, why LMC males developed a healthier identity compared to the females. Further research
20 examining gender differences among LMC males and females is needed.

21 **Conclusions and implications for future research**

22 There are a number of limitations of the current study. Firstly, the recruitment of participants were from
23 a number of locations such as adolescents attending a movement clinic, personal and community

1 contacts. However this was done to ensure adolescents with a range of motor competences were
2 included. The sample size was small due to the difficulty recruiting, and females were underrepresented
3 in the sample due to difficulty recruiting them into the study. Therefore it would be valuable to replicate
4 the study with a larger sample, comprising more females. The response rate for the interviews was low
5 (17/79) compared to the number of participants who nominated to be interviewed. This was due to
6 participant's busy schedules and their inability to reach the interview location. Selection bias was avoided
7 as all 79 adolescents who nominated to participate were contacted. Additional options such as telephone
8 and Skype calls were offered, which was only taken up by one participant. However the information
9 gathered from the interviews assisted in providing more in-depth explanations of the results. The
10 interviews continued until saturation was reached. The explanatory mixed method design was a strength
11 as it allowed for an in-depth understanding of factors impacting identity development, in particular for
12 the LMC females. Such information cannot be gathered using just questionnaire data. The more
13 vulnerable participants had a voice and were able to express their difficulties in a safe environment.

14 In summary, level of motor competence influences identity development in different ways for
15 females and males. Those most at risk were the LMC females as they experienced additional stresses
16 primarily self-imposed and influenced by their perceived level of support. This group, as well as males
17 with LMC, need well-designed support services and programs that focus on building social capital and self-
18 confidence in all youth activities, not just through sport. For example, less focus should be placed on
19 sports participation, and greater value placed on involvement in a range of other activities. This is
20 especially important for females who participate in activities that are less valued in Australian culture.
21 Adolescents develop healthier identities through positive interpersonal relationships, open and honest
22 communication and a capacity to work towards their future goals. Supportive environments that enable
23 physical activity participation and provide opportunities in a range of non-competitive environments will

- 1 help adolescents, particularly those lacking competence to develop positive peer networks and social
- 2 inclusion, an important ingredient in the health of an adolescent's identity.

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