

Predictors of Adherence in a Community-Based Tai Chi Program*

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RÉSUMÉ

Cette étude a examiné les facteurs qui influent l'adhésion dans un programme de de tai-chi à 16 semaines parmi les adultes multi-ethniques d'âge moyen et plus âgés qui vivent dans un environnement faible socio-économique à Toronto. L'analyse a été basée sur des données recueillies auprès de trois cohortes du programme de tai-chi qui ont eu lieu à partir d'août 2009 à mars 2012. La variable principale de résultat, l'adhésion, a été mesurée par le nombre total de sessions suivies par chacun des participants. L'échantillon total était de 210 participants, avec un âge moyen de $68,1 \pm 8,6$. Basé sur le modèle de régression, l'adhésion a été associée de façon significative à l'âge plus avancé, au stress plus perçu, à l'enseignement supérieur, et aux scores mentales et physiques plus élevés de composants sur le Questionnaire Abrégée 36. Inversement, une faible observance était significativement associée à une activité physique hebdomadaire de base plus élevée. Nos résultats suggèrent que nous devrions cibler les personnes les moins instruites, à la santé mentale et physique médiocre, pour optimiser l'adhésion aux futurs programmes de tai-chi communautaires.

ABSTRACT

This study examined factors affecting adherence in a 16-week tai chi program among multi-ethnic middle-aged and older adults living in a low socioeconomic environment in Toronto. Analysis was based on data collected from three tai chi program cohorts that took place from August 2009 to March 2012. The main outcome variable, adherence, was measured by the total number of sessions attended by each of the participants. Total sample size was 210 participants with a mean age of 68.1 ± 8.6 . Based on the regression model, greater adherence was significantly associated with older age, greater perceived stress, higher education, and higher mental and physical scores of Short Form-36 components. Conversely, lower adherence was significantly associated with higher baseline weekly physical activity. Our findings suggest that we target less-educated individuals with poor mental and physical health to optimize adherence for future community-based tai chi programs.

* The project was funded by Social Sciences and Humanities Research Council of Canada and Sport Canada Research Initiative.

Manuscript received: / manuscrit reçu : 23/09/13

Manuscript accepted: / manuscrit accepté : 19/09/14

Mots clés : vieillissement, adhésion, exercice, faible statut socio-économique, activité physique, tai-chi

Keywords: aging, adherence, exercise, low socioeconomic status, physical activity, tai chi

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The Canadian physical activity guideline for older adults currently recommends that individuals age 65 or older engage in physical activity for a minimum of 30 minutes a day for at least five days a week (Health Canada and Canadian Society for Exercise Physiology, 1999). Age has been shown to be inversely associated with physical activity with approximately one-third of older adults currently meeting physical activity

guidelines. Furthermore, ethnic minority groups who reside in low socioeconomic status (SES) environments are even less likely to engage in physical activity (Warburton, Katzmarzyk, Rhodes, & Shepard, 2007). Without participation in regular physical activity, older adults are prone to various health-related ailments such as hypertension, stroke, type 2 diabetes mellitus, obesity, breast cancer, and colon cancer (Haskell et al., 2007).

In contrast, older adults who do participate in physical activity programs tend to demonstrate beneficial health outcomes, including reduced incidents of falling (Gillespie et al., 2012), increased quality of life, and increased life expectancy (Ferrucci et al., 1999). Psychological health has also been shown to improve; this includes increased happiness (Elavsky et al., 2005) and decreased irritability (Lindwall, Larsman, & Hagger, 2011). As the number of older adults in the population increases, participation in physical activity programs can help older adults live healthier, longer lives.

Despite the many benefits of physical activity, approximately two-thirds of older adults do not participate in regular activity (Statistics Canada, 2005), and adherence to such programs is a major challenge, with many participants failing to regularly attend in the first few months and ceasing to attend thereafter (Dishman, 1988). Studies have shown that short-term dropout rates are almost two and a half times greater than long-term dropout rates (29% versus 73%) among community-based physical activity programs for older adults (Adams & White, 2003).

To date, a number of studies have evaluated predictors of older adults' adherence to community-based physical activity programs such as walking groups and strength training classes (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003; Shang, Wenzel, Krumm, Griffith, & Stewart, 2012; Tiedemann et al., 2012). Results from these studies suggest that socio-demographic characteristics such as having a higher education (Shang et al., 2012) are associated with higher adherence to physical activity programs. Equally important, researchers have shown positive correlation of health characteristics such as high self-efficacy (McAuley et al., 2003) and higher self-perceived physical health (Tiedemann et al., 2012) scores. Conversely, low social support from peers/group leaders to participate in physical activity (Deforche & de Bourdeaudhuij, 2000) is a social characteristic associated with low adherence. Unfortunately, research is limited in assessing the association between physical functioning and adherence. However, in the few studies conducted, it has been shown that adherence to physical activity programs in older adults is positively associated with better cognitive capacity such as higher reaction time (Tiedemann et al., 2012) and greater physical functioning such as faster walking speed (Tiedemann, Sherrington, & Lord, 2011).

Tai chi is a form of physical activity that utilizes low-impact movements and low-intensity aerobic activity (Song, Lee, Lam, & Bae, 2007). The swift and slow movements result in a physical activity with very little risk of injury (Schaller, 1996). Many studies have demonstrated that tai chi involving older adults is a safe

and beneficial form of physical activity that can decrease joint pain (Song et al., 2007), reduce falls (Gillespie et al., 2012), and increase quality of life (Klein & Adams, 2004). Other components of fitness have also been shown to improve, most notably strength (Song, Lee, Lam, & Bae, 2003) and flexibility (Lee, Pittler, & Ernst, 2008). Tai chi has also been shown to decrease depression and anxiety (Wang, 2012) while increasing self-efficacy (Jones et al., 2012) and self-esteem (Lee, Lee, & Woo, 2010). Even more appealing is the low cost of maintaining a tai chi program as it does not require any extra equipment or costly facilities (Church, Goodall, Norman, & Haas, 2012). It requires only a limited amount of space to perform movements, and it may be practiced in any open area such as a park or community centre. Dropout rates for tai chi programs for older adults have been reported to be less than 25 per cent (Li et al., 2005), and while researchers have acknowledged that attendance rates drop after tai chi initiation (Ling et al., 2003), characteristics and predictors pertaining to attendance have not been a focus. Lastly, researchers have yet to focus on a multi-ethnic participant pool; consequently, there is a lack of literature observing adherence to community-based physical activity programs in older adults within a diverse ethnic sample.

Given the current growing population of older adults and the increasing popularity, effectiveness, and affordability of tai chi, understanding predictors of adherence will provide important insight into the utility of tai chi programming in an increasingly diverse, older adult population in Canada. Because little is known about adherence to tai chi programs, the purpose of our current study was to determine demographic, behavioral, physical, and mental health factors affecting adherence in a 16-week tai chi program among multi-ethnic middle-aged and older adults living in a low-SES environment within a major Canadian city.

Data and Methods

Study Design

The present study was part of a larger study (Manson, Rotondi, Jamnik, Ardern, & Tamim, 2013) conducted to assess the effectiveness of tai chi in improving physical and mental health of older adults. For this study, three cohorts were involved in programs conducted in two community locations in the Greater Toronto area; Jane and Finch as well as Dundas and Spadina. These areas were chosen for their diverse ethnic make-up and their low SES (City of Toronto, 2011). The Jane and Finch community consists of over 50,000 people, and ethnic minority groups make up over 70 per cent of its population (SWP Community Ministries, 2005).

Dundas and Spadina contains a high concentration of older adults of Chinese origin (City of Toronto, 2003). The first program took place in a Jane and Finch Toronto Community Housing building, and participants were followed from August 2009 to December 2009. The second program took place in a community center located at Dundas and Spadina, and participants were followed from March 2011 to July 2011. Lastly, the third program took place in a Jane and Finch community centre from November 2011 to March 2012. The study protocol was approved by the ethics review committee of York University, and all data were obtained using informed and written consent from all study participants. Individuals who were illiterate or unable to understand the questionnaire had verbal confirmation obtained followed by written consent.

Participants

Participants were recruited for this study using flyers, newspaper advertisements, and word of mouth. No participants were paid for attending any tai chi sessions; however, participants from the second and third cohorts received a \$10 gift card upon completion of post-cohort questionnaires. Participation was restricted to individuals who were age 50 and older, who lived in either community, with the medical capacity to participate in an exercise program. Participants were screened by the Physical Activity Readiness Medical Examination (PAR-Med-X) (Chisholm, Stewart, & Cooks, 1987) and the Physical Activity Readiness Questionnaire (PAR-Q) (American College of Sports Medicine, 2000).

Tai Chi Program

The tai chi program for each of the cohorts ran for 16 weeks with six to seven classes offered per week. Participants were encouraged to attend at least two classes per week. Three separate qualified tai chi masters conducted and supervised their respective cohorts. Instructors were all male, trained in Yang style, and ranged in age from 65 to 84. All classes consisted of a 15-minute warm-up of Qigong (breathing and meditation exercise) followed by 45 minutes of Yang-style tai chi for a total of 60 minutes per class. Yang-style tai chi emphasises body and trunk rotations while utilizing body alignment awareness. Tai chi classes were offered free of charge to all participants.

Adherence Measures

A research assistant monitored and collected attendance for each class. The outcome variable, adherence, was measured by the total number of sessions attended by each of the participants.

Independent Variables

The predictor variables included demographic, behavioural, health, physical, and psychosocial indicators. The demographic variables included age, gender, marital status, education, and income (Region of Waterloo, 2012). Behavioural and health variables included smoking, alcohol use, weekly physical activity using the Canadian Physical Activity, Fitness and Lifestyle Approach (CPAFLA) health benefit zone (Canadian Society for Exercise Physiology, 2003), co-morbidities, and the physical and mental components of the Short Form-36 (SF-36) (Ware & Sherbourne, 1992). Physical variables evaluated were hand grip strength, timed “up and go” test, and sit and reach. Psychosocial measures consisted of the modified social support scale by Huang, Gua, Lin, and Kernohan (2003) and a perceived stress scale (Cohen, Kamarack, & Mermelstein, 1983). All baseline predictor variables were measured prior to commencement of the 16-week tai chi intervention. A brief description of all predictor variables can be found in Manson et al. (2013).

Statistical Analysis

The outcome variable – total sessions attended – was compared across the different categories of the demographic, behavioural and health, physical, and psychosocial characteristics of study participants. To assess the bivariate relationships between the predictor variables and adherence, we performed *t*-tests and analyses of variance for categorical variables and simple linear regression for continuous variables. Additionally, we performed multiple linear regression analysis to assess the independent relationship between participants' characteristics and the number of tai chi sessions attended. All analyses were conducted using IBM SPSS Statistics 21 software with statistical significance set at $\alpha < 0.05$.

Results

Of the 210 participants who were enrolled in the tai chi intervention, cohort two accounted for the greatest number of participants with 80 (38.1%), followed by cohort one with 78 (37.1%). Characteristics of the sample are shown in Tables 1 and 2. Overall, 167 (79.9%) participants were female, only 29 (15%) had more than high school education, and 135 (71.4%) earned less than \$14,000 per year. The average age of participants was 68.1 ± 8.6 years (range: 50 to 87 years). Chinese and South American individuals comprised a majority of participants with 74 (36.1%) and 54 (26.3%) participants respectively. Regarding chronic conditions, 123 (58.5%) had two or more conditions with hypertension and arthritis having the highest number of participants diagnosed with 105 (50.0%) and 102 (48.6%) respectively.

Table 1: Mean differences of tai chi sessions attended – baseline characteristics of study participants

Baseline Characteristics	n (%)	Sessions attended Mean (SD)	p value
Cohort	210 (100)	16.8 (15.1)	
1	78 (37.1)	14.7 (11.4)	
2	80 (38.1)	15.9 (18.3)	
3	52 (24.8)	21.4 (13.7)	.036
Demographic			
<i>Gender</i>			
Male	42 (20.1)	14.0 (13.6)	
Female	167 (79.9)	17.6 (15.4)	.168
<i>Age groups</i>			
50–64 years	73 (35.3)	16.2 (14.7)	
65–74 years	86 (41.5)	16.9 (14.7)	
75+ years	48 (23.2)	18.4 (15.0)	.735
<i>Education</i>			
< High school	94 (46.5)	15.0 (14.1)	
High school	79 (39.1)	16.8 (15.4)	
> High school	29 (14.4)	21.1 (14.4)	.152
<i>Marital Status</i>			
Unmarried/Widowed/Divorced	112 (54.9)	16.6 (13.6)	
Married with partner	92 (45.1)	16.9 (16.3)	.904
<i>Annual Income^a</i>			
< \$14,000	135 (71.4)	16.5 (15.7)	
\$14,000–\$30,000	35 (18.5)	18.4 (13.7)	
> \$30,000	19 (10.1)	14.4 (11.1)	.661
<i>Ethnicity</i>			
Chinese	74 (36.1)	17.0 (19.2)	
South American	54 (26.3)	14.2 (12.4)	
European	33 (16.1)	19.5 (12.0)	
Other	31 (15.1)	17.8 (11.1)	
Canadian	13 (6.3)	21.5 (14.5)	.414
Behavioural and Health			
Smoking	4 (1.9)	5.2 (8.6)	.122
Drinking	45 (21.4)	17.7 (13.7)	.649
<i>Chronic Conditions</i>			
Hypertension	105 (50.0)	16.4 (13.8)	.692
Arthritis	102 (48.6)	17.5 (14.5)	.483
Diabetes mellitus	45 (21.4)	14.1 (12.5)	.175
Sleep disturbance	54 (25.7)	15.2 (13.7)	.378
Depression	31 (14.8)	18.4 (13.1)	.531
Hearing impairment	26 (12.4)	17.2 (17.3)	.878
Heart disease	12 (5.7)	12.5 (9.7)	.299
COPD ^b	10 (4.8)	10.6 (9.2)	.181
Two or More Conditions	123 (58.5)	16.1 (13.0)	.456

^a Income currency is Canadian dollars

^b COPD = chronic obstructive pulmonary disease

The average number of sessions attended for the combined cohorts was 16.8 ± 15.1 . A significant difference ($p = .036$) in the average number of sessions attended was observed among the three cohorts with cohort three averaging the most sessions attended (mean = 21.4 ± 13.7), followed by cohort two (mean = 15.9 ± 18.3) and cohort one (mean = 14.7 ± 11.4). Fisher's least significant difference (LSD) post-hoc test found a significant difference between cohorts one and three ($p = .013$) and cohorts two and three ($p = .040$). The number of participants who attended the different

sessions ranged from a minimum of five participants per session to a maximum of 34 participants per session (range for cohort one of 5 to 20, range for cohort two of 6 to 34, and range for cohort three of 4 to 24). Additionally, of the 210 participants who enrolled, 56 (26.7%) were lost to follow-up.

None of the demographic, behavioural and health, physical, and psychosocial variables were significantly different when comparing those who completed the study and those who were lost to follow-up (results not

Table 2: Results of simple linear regression analysis for tai chi sessions attended – baseline characteristics of study participants

Baseliner Characteristics	Mean (SD)	β (SE)	p value
Behavioural and Health			
<i>Physical Activity</i>			
Weekly Physical Activity ^a	6.72 (3.0)	-0.53 (.34)	.121
<i>SF-36^b</i>			
Physical component			
Physical functioning	49.2 (7.8)	0.32 (.14)	.024
Role physical	75.0 (21.6)	0.06 (.04)	.175
Bodily pain	79.7 (27.2)	0.12 (.03)	.001
General health	68.7 (24.7)	0.07 (.04)	.072
Mental component			
Vitality	64.8 (20.4)	0.10 (.05)	.052
Social functioning	52.0 (8.9)	0.22 (.12)	.075
Role emotional	64.2 (20.1)	0.04 (.05)	.360
Mental health	86.5 (20.0)	0.07 (.05)	.168
	83.5 (24.3)	0.13 (.04)	.002
	75.0 (17.3)	0.08 (.06)	.149
Physical			
Combined hand grip (kg)	54.2 (17.6)	0.03 (.06)	.604
Up and go (secs)	7.6 (3.2)	-0.02 (.33)	.932
Sit and reach (cm)	26.4 (9.0)	0.33 (.12)	.006
Psychosocial			
Social support	4.5 (1.9)	-0.05 (.52)	.915
Perceived stress scale	18.9 (8.5)	-0.12 (.12)	.335

^a **Physical Activity: based on the Healthy Physical Activity Participation Questionnaire**

^b **SF-36 = Short form-36 health survey**

shown). Furthermore, Tables 1 and 2 display the mean differences between total sessions attended and baseline demographic, behavioural and health, physical health, and psychosocial characteristics of study participants. No significant differences were found among demographic or psychosocial variables using bivariate analysis. Simple linear regression found the sit-and-reach exercise to be the only significant predictor of adherence ($\beta = 0.33$, $p = .006$). Additionally, simple linear regression found the SF-36 physical component total ($\beta = 0.32$, $p = .024$) to be significant while the SF-36 mental component total ($\beta = 0.22$, $p = .075$) approached significance.

The results of the multiple linear regression analysis conducted using standard entry methods are shown in Table 3. Demographic variables including age ($p = .049$) and education ($p = .027$) were found to be significant predictors of adherence ($R^2 = .191$). Participants with greater than high school education attended, on average, nine more classes than those who had less than high school education ($\beta = 9.30$, $p = .027$). Additionally, older age was a significant predictor of more sessions attended ($\beta = 0.39$, $p = .049$). Although no physical components reached statistical significance, there was a trend for sit and reach ($\beta = .027$, $p = .072$). Participants who indicated better physical ($\beta = 0.52$, $p = .025$) and mental ($\beta = 0.45$, $p = .039$) health were likely to attend more sessions. Conversely, weekly physical activity ($\beta = -1.20$, $p = .009$) was negatively

associated with more sessions attended. Among psychosocial variables, participants who were more stressed were more likely to attend classes ($\beta = 0.37$, $p = .059$).

Discussion

This study is the first to examine the predictors of adherence to a tai chi program in Canadian low-income, multi-ethnic, middle-aged and older adults over a 16-week intervention. It has been shown that older adults residing in low-SES environments within Canada are more prone towards morbidity and lack of exercise (Menec, Shooshtari, Nowicki, & Fournier, 2010). In the present study, adherence was significantly and positively associated with older age, higher education, and better mental and physical health. Conversely, participants who were more physically active at baseline attended fewer tai chi classes compared to those who were less physically active. Our findings are of importance as predictors of adherence to physical activity programs can benefit vulnerable low-SES communities.

Our study had a dropout rate of 26.7 per cent which, when compared to other studies, was within a normal range. A tai chi study conducted in Hong Kong had a dropout rate of 19 per cent (Jones, Dean, & Scudds, 2005); however, other studies that targeted individuals with chronic conditions have had dropout rates of 34 per cent (Yip et al., 2007) and as high as 43 per cent

Table 3: Results of the multiple linear regression analysis for the association between participants' characteristics at baseline and tai chi sessions attended

(n = 210)	B ^a (SE)	β ^b	p	95% CI
Cohort				
1	0.28 (3.3)	.009	.932	-6.3 – 6.9
2	Referent	—	—	—
3	1.50 (3.7)	.040	.684	-5.8 – 8.9
Demographic				
<i>Gender</i>				
Female	5.90 (4.7)	.152	.211	-3.3 – 15.2
Male	Referent	—	—	—
Age	0.39 (.19)	.217	.049	.001 – .787
<i>Education</i>				
< High school	Referent	—	—	—
High school	3.30 (2.7)	.106	.219	-2.0 – 8.7
> High school	9.30 (4.1)	.210	.027	1.0 – 17.6
<i>Marital status</i>				
Married with partner	2.90 (3.2)	.096	.362	-3.4 – 9.3
Unmarried/Widowed/Divorced	Referent	—	—	—
Behavioural and Health				
<i>Co-morbidities</i>				
Less than two	Referent	—	—	—
Two or more	0.32 (2.8)	.096	.910	-5.2 – 5.9
<i>Physical Activity</i>				
Weekly physical activity	-1.20 (.45)	-.235	.009	-2.1 – -.311
<i>SF-36</i>				
SF-36: Physical component	0.52 (.22)	.241	.025	.068 – .974
SF-36: Mental component	0.45 (.22)	.225	.039	.023 – .896
Physical				
Combined hand grip	0.06 (.11)	.071	.587	-.158 – .278
Up and go	0.99 (.68)	.158	.149	-.363 – 2.3
Sit and reach	0.27 (.15)	.164	.072	-.025 – .568
Psychosocial				
Social support	0.39 (.92)	.042	.670	-1.4 – 2.2
Perceived stress scale	0.37 (.19)	.206	.059	-.015 – .773
R²		.191		

^a Unstandardized beta

^b Standardized beta

in research involving osteoarthritis of the knee (Song et al., 2003). No significant differences were found between any of the demographic, behavioural and health, physical, and psychosocial characteristics at baseline. In a study conducted by Mullen et al. (2013), participants who completed an exercise program were more likely to have greater self-efficacy, better leg balance, and faster stair-walking speeds compared to drop outs. Future studies using tai chi as an exercise should attempt to determine barriers to adherence for low-income older adults.

Results of the present study showed that increasing age was positively associated with more sessions attended. This finding is consistent with the work of Hopman-Rock, Borghouts, and Leurs (2005), who studied the effects of a seven-month television-based exercise program tailored towards older adults. In that study, increasing age was found to be a significant

predictor of adherence to this exercise program. Additionally, Tobi, Estacio, Renton, and Foster (2012) found a positive relationship between increasing age and adherence to government-funded exercise programs (e.g., swimming, circuit training, or walking clubs) in a sample consisting mainly of members of ethnic minorities. In our study, this finding may be explained by multiple factors such as more leisure time opportunities for middle-aged and older adults, social networks developed throughout the sessions among study participants and tai chi master, the gentle nature of this form of activity, and the flexibility to schedule around daytime classes. Additionally, our results are consistent with other studies that have shown that higher education was correlated with greater adherence to physical activity programs (Arikawa, O'Dougherty, Kaufman, Schmitz, & Kurzer, 2012; Stineman et al., 2011). For example, Stineman et al. found that older

adults who achieved greater than a high school education were more likely to attend an on-site exercise program. Future physical activity programs in low-SES environments should consider targeting lower-educated individuals by utilizing additional resources such as educational sessions or phone call reminders to increase adherence.

From among the behavioural and health variables studied, weekly physical activity, the SF-36 physical component, and the SF-36 mental component were all found to be significant. Participants who reported greater weekly physical activity rates at baseline were significantly less likely to adhere to the tai chi program. These findings contradict previous research reporting that individuals who participate in additional physical activity are more likely to attend aerobic physical activity programs (Arikawa et al., 2012; Latka, Alvarez-Reeves, Cadmus, & Irwin, 2009). We speculate that our results are due to the leisurely pace and low calorie expenditure that tai chi offers which has been compared to low-moderate walking speeds (Ainsworth et al., 2000). Moreover, tai chi instructors catered their classes towards individuals who were unfamiliar with tai chi. Although tai chi's leisurely pace may have encouraged inactive adults to participate, the lack of physical exertion may have deterred more-active middle-aged and older adults from adhering. Additionally, both physical and mental SF-36 scores were positively and significantly associated with greater tai chi adherence.

Interestingly, to our knowledge, no studies have used the SF-36 questionnaire as a predictor of adherence to physical activity programs in older adults. However, Tiedemann et al. (2012) found individuals who scored higher on the shorter SF-12 physical component took more steps in their exercise program. Administering the SF-36 questionnaire at baseline is a practical method of predicting adherence to physical activity programs among multi-ethnic, low-SES, middle-aged and older adults. However, future research examining predictors of adherence in middle-aged and older adults should focus on the various sub-components of the SF-36 questionnaire for potential additional predictor variables.

The present study found no significant relationship between adherence to our tai chi program and the predictors of hand grip strength and up-and-go walking speed. Similar results in terms of adherence and hand grip strength were reported in studies by Jette et al. (1998) and adherence and walking speed by Tiedemann et al. (2012). Furthermore, as shown by the sit-and-reach test, a positive relationship exists between flexibility and adherence, albeit this association only approached significance. One possible explanation for our findings

may be that tai chi is a gentle, low-intensity exercise which allows participants to participate at their own leisurely pace. Slow movement and tempo associated with tai chi does not require participants to be agile and strong to adhere, but allows middle-aged and older adults who may be in poor physical condition (and at a lower general fitness level) to engage in less-strenuous (and tailored) bouts of activity. Additionally, mastery of certain tai chi poses that required flexibility may have boosted self-confidence among participants resulting in greater flexibility. However, elongated poses and stretching associated with tai chi may have negatively affected individuals with poor flexibility, thus limiting their adherence to our program. Nonetheless, the interesting finding of the positive relationship between baseline flexibility and adherence warrants further research. The suggestion for improving future studies is to conduct additional flexibility tests such as the V-sit and trunk rotation tests.

Although some research has suggested that psychosocial factors such as stress may limit older adults' participation in physical activity, none have explicitly assessed the practice of tai chi. For example, Laugero, Falcon, and Tucker (2011) found a significant relationship between greater stress scores and lower physical activity in older adults; however, these results are contrary to the trend we observed within our study results. We suggest that the social interactions developed among peers in a community-based setting and the relaxed pace of tai chi contributed to the relationship. Moreover, lower anxiety and stress from actively participating may have allowed for an increase in capability and self-confidence resulting in better adherence. Future studies should attempt to measure the effect of social interactions between participants and/or instructors and adherence to an exercise program by administering additional questionnaires and creating focus groups.

Several limitations need to be taken into consideration regarding the validity of the results. First, as opposed to a randomized control trial, daily changes could not be accounted for in physical activity, lifestyle, attitude, and behaviour. Second, each cohort took the program in a different season; therefore, disparities attributed to seasonal variations may have impacted adherence. Equally important is that, excluding fitness measures, all other data were collected through self-report questionnaires with participants themselves choosing to participate in the study, hence limiting generalizability and creating the possibility of self-report bias. Additionally, our sample included only 210 participants; therefore, widely dispersed categories such as ethnicity could not be entered into the multivariate regression. Furthermore, information about reasons

for not completing the study may have provided explanation to the reported prevalence of *lost to follow-up* (26.7%) and insight regarding potential unidentified characteristics that may have been associated with completing or not completing the study. Lastly, all cohorts' tai chi programs were administered by different instructors, possibly allowing their personal style to affect progress and attendance which has been demonstrated in a previous study (Hawley-Hague et al., 2014).

In conclusion, our results provide added insight into predictors of adherence to a community-based tai chi program for low-SES, multi-ethnic, middle-aged and older adults, residing in a major Canadian city. On this basis, programs tailored to less-educated individuals with poor mental and physical health may be necessary to optimize adherence within the most at-risk segment of the older adult population. Future research should focus on flexibility measures and perceived stress as potential predictors of adherence to a community-based tai chi program.

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