

Depressive Symptoms among Community-Dwelling Older Adults with Mild to Moderate Knee Osteoarthritis: Extent, Interrelationships, and Predictors

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Abstract The present cross sectional study strove to examine the prevalence and extent of comorbid depressive symptoms and its relationship with pain, function, disease impact, body mass index, medication history, and self-efficacy for managing pain, and other symptoms among a cohort of generally healthy older knee osteoarthritis (OA) patients with mild to moderate disease. Data previously collected on 71 generally healthy active women and 15 men with either unilateral or bilateral knee mild to moderate knee osteoarthritis, mean age, 72.47 ± 7.15 years were analyzed with correlation analysis and descriptive statistics using the SPSS program. Analyses revealed: 1. More than 20% of the present cohort could be categorized as having severe clinical depression using a more stringent cut-off point than the standard, even though none were being treated for this condition; 2) Cases categorized as exhibiting depressive symptoms indicative of depressed mood tended to have more pain, worse mobility, and lower self-efficacy perceptions than those who were not exhibiting such symptoms; 3) Those with low self-management related self-efficacy were more likely to report depressive symptoms than not ($p < .01$). It is concluded that it is essential to routinely screen older adults with early stage osteoarthritis of the knee for depression, as well as their beliefs about their ability to manage their disease in efforts to reduce the immense disability burden of knee osteoarthritis.

Keywords: depression, disability, knee osteoarthritis, pain, self-efficacy

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1. Introduction

Osteoarthritis, the most common joint disease affecting older people, causes appreciable pain, disability, and reduced life quality [1,2,3,4,5]. Principally due to symptoms arising from the pathological breakdown of the cartilaginous lining and underlying bony structures of one or more joints, [6,7] late stage or advanced osteoarthritis can be extremely debilitating [8,9]. Often attributed to the wear and tear processes of aging, a variety of potentially remediable medical comorbidities, joint overload, obesity, and biological factors may hasten its advancement [10,11,12]. Emerging data also reveal the disease process may be influenced adversely by a variety of psychological factors such as depression [13-19] and/or the self-efficacy beliefs held by the affected individual [20,21], both mutable factors.

However, even though comorbid depression has been linked to reduced adherence to and effectiveness of pain interventions, poor health outcomes, plus increased medical costs [5,22,23], few current clinically oriented osteoarthritis studies even mention the possible role depression might play in moderating or mediating the

disease process [3,24]. Moreover, very few have examined older adults with early stage, as opposed to the later stage disease, even though early recognition and treatment of a depressive disorder may be most relevant in those with minimal to moderate disease [25,26]. Self-efficacy, another factor related to wellbeing and depression [20,27] is also not well explored in the current literature in relation to improving our understanding of factors specifically related to the elderly adult with mild to moderate knee joint osteoarthritis that might improve outcomes, despite its long well established linkage to self-management and adherence that has been demonstrated in the arthritis self-management realm, in general, for more than 30 years.

Since depression is often an overlooked or under recognized correlate among adults with medical health problems [29], and its presence may seriously impact self-management activities advocated for assisting people with knee osteoarthritis, we felt it important to examine the extent to which individuals with moderate knee osteoarthritis could be expected to be experiencing concomitant depressive feelings, as well as possible predictors of this. We were curious to examine if adults living in the community might be experiencing lower than optimal quality of life due to factors such as cognitions that are often neglected in the context of the medical

model or not discussed directly in the relevant research [3], and if so, what the implications might be as far as intervening and treating the condition effectively.

We specifically examined whether the hypothesis generated by Knoop et al. [19] was valid for our sample; that is whether 20% would be categorized as experiencing a depressive phenotype; and second, whether the relationship between the presence of depressive symptoms and other common disease correlates would be a potentially important one, given that depression is often linked to obesity, as well as pain, and function, but these interrelationships and their relevance for guiding treatment are not always clearly integrated.

The goal was to heighten our understanding of the nature of this highly prevalent and disabling health condition, and to help guide future research and intervention directives to minimize the disease burden. In keeping with the exploratory nature of this study, we employed a cross-sectional, descriptive approach with some analytic computations to document the presence of depressive symptoms among a sample considered to be mentally healthy and active.

In accord with Knoop et al. [19] it was hypothesized that a substantive percentage of the present sample would report depressive symptoms of sufficient magnitude to qualify as having a possible severe mood disorder even though none had a history of depression and none were receiving treatment for depression; 2) the prevailing disability of the sample would be related in part to the magnitude of the reported depressive symptomology scores; 3) pain would be the strongest predictor of depressive symptom magnitude.

2. Materials and Methods

2.1. Sample

Of the available existing records of 100 cases of knee osteoarthritis originally recruited through the cooperation of local rheumatologists and primary care practitioners as part of an ethically approved hospital based clinical study in a large North American metropolitan area, we deemed 86 cases eligible to be included in the present analysis. All cases selected for study had to have radiographic and clinical evidence of mild to moderate knee osteoarthritis, as opposed to severe disease, had to be at least 60 years of age, generally healthy, and living independently in the community. None had inflammatory arthritis, osteoarthritis of other joints, severe knee osteoarthritis, comorbid cognitive impairments, or uncontrolled cardiac conditions, and all had been receiving medical care, but no form of physical intervention for their osteoarthritis.

Since this research was specifically designed to focus on examining mutable factors associated with moderate as opposed to severely disabling disease, only participants categorized as being typical of the functional stages 1 or 2 of the condition, where the cartilage lining the joint is experiencing a breakdown of its substance and surface, but where the joint structure is not severely disrupted were studied. As well, to highlight the fact that depression, a mutable factor, is often overlooked as a significant problem among older adults with early stage knee osteoarthritis, only those with no mental health history

were studied. This approach was adopted in the belief that very little is known about the characteristics of early stage knee osteoarthritis, and whether more could be done during this time period to minimize the disability.

2.2. Procedures

After providing informed consent, all participants had attended a single standardized assessment session where their demographic and clinical characteristics were recorded in a systematic way. The demographic features assessed included: age (years), gender (male or female), body weight (kg), body height (m), medical history (including name of pre-existing health condition, and numbers of these health conditions). The clinical features included measures of pain, functional impact of the disease, depressive symptoms, walking speed, walking endurance, perceived exertion after walking for six minutes at self-paced speed, and self-efficacy for pain and other symptoms management, variables most consistently studied in the literature detailing knee osteoarthritis disability and its outcomes.

2.3. Instruments

The specific instruments used to capture the desired data were questionnaires with known validity and reliability, including a 10 cm long visual analogue (VAS) pain scale, where 0 represented least possible pain and 10 represented worst possible pain; the Arthritis Impact Measurement Scale (AIMS) [30] a measure of functional health that indicates how well a subject believes they are doing given all the ways arthritis can affect them as reported on a scale of 0-10, where a score of 0 indicates a subject is doing 'Very Well' and a score of 10 indicates they are doing 'Very Poorly'; and a depression measure known as the Centers for Epidemiologic Studies Depression scale (CES-D) [31], which assesses the self-reported frequency of depressive symptoms experienced in the past week in response to 20 questionnaire items comprising six scales reflecting major depression dimensions rated on a 0-3-point Likert scale, where higher scores indicate more frequent depressive symptoms in the past week. These scores could range from 0-60, with higher scores indicating more depressive symptoms [31]. The instrument also provides guidance for categorizing depression into degrees of severity ranging from mild to severe as follows: scores 0-9=no depression; 10-16=mild depression; 17-26 moderate depression; 27-60 severe depression [31].

To further examine if extent of depressive mood was related to one or more clinical variables, a cut-off point for differentiating high depressive symptoms from low rates of symptoms of 16 as described by Knoop et al. [19] and Comijs [32] and the developer [31], plus a higher cut-off point of ≥ 20 was used to minimize false positives [31]. This dichotomous categorization of the CES-D score based on cut-off points of both 16 and 20 was used to represent the presence of low-mild versus moderate-major depressive symptoms, and data were coded as 0 to denote the presence of low depressive rates, and 1 to denote high rates. Other variables assessed were free and fast speed walking velocity and walking distance achieved in a six minute period at a regular pace [33] using an electronic recording device, plus perceived exertion after walking for

six minutes using a subjective rating scale ranging from 1-15 (low-high exertion).

Self-efficacy or confidence beliefs with respect to pain and other symptoms management scores as outlined by Lorig et al. [34], where a 10 represents low confidence or certainty and 100 represents high confidence or certainty for 5 and 6 subscale items, respectively was also recorded. These data were also examined using 30 point gradations to depict Low (10-40), Moderate (41-69), and High self-efficacy beliefs (70-100).

2.4. Analysis

All desired data were systematically transposed onto an excel spreadsheet and analyzed using SPSS version 19.00. In addition to reporting descriptive outcomes, cross-tabulations, and correlation analyses, logistic regression was used to examine predictors of more severe versus less severe depressive symptoms. Linear regression using enter and backward step-wise approaches were conducted on the statistically significant correlates of the composite depression symptomology scores identified in the univariate analyses to determine the predictors of depressive symptom severity.

More specifically, this study examined the frequency with which depressive symptoms were reported in the sample, the magnitude of these symptoms, where present, and the strength of the relationship between pain, the presence of depressive symptoms, the magnitude of the depressive symptom scores, and levels of self-efficacy for pain and other-symptoms management, and ambulatory status. A level of $p \leq 0.05$ was considered significant.

3. Results

The present sample of 71 women (mean age 72.49 ± 7.19 years) and 15 men (mean age 73.33 ± 7.18 years, range 60-89 years) with either unilateral (N=48) or bilateral knee joint osteoarthritis (N=38) and their demographic and clinical features are shown in Table 1. As indicated by the average numbers of pre-existing conditions of 0.9 ± 0.9 this was a relatively healthy sample with few comorbid health conditions. Based on their weight and height data, and an average body mass index ($w.h^{-2}$) of 28.2 ± 4.4 (range 20.8-40.2), the majority were overweight, while some were normal weight, underweight, or excessively obese. All were receiving medical care for their condition, but none were being treated or had ever received treatment for any form of mental health problem.

Based on their average pain scores as experienced in the past week using a 0-10 point visual analogue pain scale were 4.8 ± 2.8 , and the cumulative disease experience recorded on the Arthritis Impact Measurement Scale [30] ranging from 0-10 with higher numbers denoting worse conditions was 4.9 ± 2.0 , it can be assumed most were experiencing only modest levels of pain and impairment.

This was borne out by their average self-paced walking distance achieved in 6 min of 362 ± 115 m in the absence of any assistive devices, and their fast and self-paced walking velocities as recorded on level of 51.90 ± 15.40 and 47.20 ± 14.61 $m.min^{-1}$ respectively, despite their average perceived exertion scores recorded at the end of the distance walking test of 12.09 ± 2.13 , that suggested this was quite high, on average.

Moreover, despite their generally modest pain levels or reported pain, the composite self-efficacy scores for pain control that represent 5 related items, showed most or 56% of participants studied were not highly confident they could effectively control or manage their pain. Similarly, as shown in Table 1 their confidence as regards their ability to control symptoms other than pain, a composite score representing 6 related items, was less than optimal, with a mean of 70.3 ± 22.12 (range 10-100) and again suggested only 44% were highly confident to meet the challenges brought on by the condition other than pain, including fatigue, and managing depressed feelings.

Based on the CES-D scores, where scores of 16 or higher are generally used as a cut-off score denoting possible depression [31], 24 or 27.9% of the cohort was categorized as having an elevated risk of depression. When applying a more stringent cut-off score of 20, 20.9% of the cohort were categorized as having moderate to severe depression even if this was not verified clinically. This was comparable to the 20% categorized as having moderate to severe depressive symptoms as categorized by the four dimensions of severity proposed Radoff [31].

Table 1. Characteristics of Study Subjects (N=86)

Variables	Mean \pm SD	Min	Max	Range
Age (year)	72.5 \pm 7.2	60	89	29
No. preexisting conditions	.9 \pm .9	0	4	4
CES-D Scores (0-60)	12.0 \pm 9.3	0	40	40
Body mass index ($w.h^{-2}$)	28.1 \pm 44.4	20.8	40.2	19.4
VAS Scores (0-10)	4.8 \pm 2.8	.0	10.0	10.0
AIMS Impact Score (0-10)	4.9 \pm 2.0	1.0	10.0	9.0
Self-paced velocity (10 m) $m.min^{-1}$	47.2 \pm 14.6	13	79	66
Fast-paced velocity (10m) $m.min^{-1}$	51.9 \pm 15.4	13.6	84.7	71.1
6 minute walking distance (m)	362.4 \pm 115.8	53	607	553
Perceived exertion (0-15)	12.1 \pm 2.1	7	18	11
Pain SE (10-100)*	69.8 \pm 19.8	10	100	90
Other Symptoms SE (10-100)**	70.3 \pm 22.1	10	100	90

Abbreviations: AIMS=Arthritis Impact Measurement SubScale of overall pain experience; CES-D=Centers for Epidemiological Studies Depression Scale; SE=Self-efficacy; VAS=Visual Analogue Pain Score of average pain experienced in past week.

*Pain SE Sub-Domain Questions examine confidence about ability to:

- Decrease pain substantially
- Continue activity
- Control pain to be able to sleep
- Use methods other than medication to relieve pain
- Identify benefits for making large pain reductions with methods other than medication

**Other Symptom SE Sub-Domain Questions examine confidence about ability to:

- Control fatigue
- Be active without aggravating condition
- Be able to do something to help if feeling blue
- Be able to manage pain compared to others with arthritis
- Be able to manage symptoms so as to enjoy things of value
- Be able to deal with the frustration of arthritis

As outlined in Table 2, at least 20% of participants achieved a score on the CES-D of ≥ 16 , indicating possible mild-severe symptoms of depressed mood. Although statistically indistinguishable as far as gender was concerned, more males than females, that is, 46% of men versus 23% of the women met the less stringent criterion for depression of 16, but men and women reported severe depressive symptoms at comparable rates of 21% and 20%, respectively using the more stringent cut-off score of ≥ 20 . Slightly more cases with bilateral joint disease could be classified as have more severe depressive symptoms when

compared to those with unilateral joint disease with rates of 21% versus 20%, respectively; when the cut-off score was 20, but at a cut-off score of 16, more cases or 31% with bilateral joint disease reported experiencing modest depressive symptoms in the past week, when compared to those with unilateral joint disease, where 25% reported experiencing depressive symptoms.

Other findings depicted in Table 2 show differences in pain scores between those with and without depressive symptoms, in favor of the non-depressed subgroup when assessed by analysis of variance, regardless of the stringency of depressive categorization. Other differences evident at both the higher level as well as the lower level cut-off score representing positive depressive symptomology included those pertaining to self-paced and fastest walking speed over a 10m walkway, distance walked at self-paced speed in 6 min, and self-efficacy beliefs, which were all indicative of significantly greater difficulties in the more highly depressed subgroups, when using a $p \leq .05$ criterion.

Table 2. Mean, Standard Error of the Mean (SEM), Percentage Scores of Sample when Categorized as Having Depression or No Depression Symptoms Using CES-D^a cut-off scores of 16 and 20 Showing Where Patients Were Worse off (N=86)

Depressed	CES-D Cut-off 16		CES-D Cut-off 20	
	Y (N=24)	N (N=62)	Y (N=18)	N (N=67)
Age	73.3(1.4)	72.1(.9)	74.1(1.6)	72.1(.9)
Gender	F 23% M 46%		21% 21%	
Type	U 25% B 31%		20% 21%	
BMI	29.3(.8)	27.7(.6)	28.9(1.6)	27.9(.6)
Dis #	1.3(.2)	0.7(.1)	1.2(.3)	0.8(.1)
VAS	5.9(.6)	4.2(.3)*	5.9(.7)	4.4(.3)*
AIMS	5.7(.4)	4.6(.2)**	5.6(.5)	4.8 (.2)
CES-D	24.3(1.4)	7.3(.6)**	26.2(1.6)	8.1(.6)**
Pain SE	56.7(3.7)	74.8(2.2)**	52.3(4.2)	74.5(2.1)**
Other SE	53.9(4.9)	76.6(2.3)**	49.3(5.8)	75.6(2.1)**
SP vel	41.2(3.6)	49.4(1.6)*	38.2(3.9)	49.5(1.6)*
Fast vel	45.3(3.7)	54.5(1.7)*	41.7(4.0)	54.6(1.7)**
6 min wlk	310.7(13.9)	382.4(26.7)	282.1(25.4)	384.9(12.6)*

Abbreviations: AIMS=Arthritis Impact Measurement Scale; B=bilateral; BMI=body mass index; CES-D=Centers for Epidemiological Studies Depression Scale; Dis-number of comorbid diseases; Fast vel=fast paced walking velocity; SE=self-efficacy; SP vel=self-paced walking velocity; VAS=visual analogue scale; U=unilateral.

^a Key conditions were: cardiovascular disease; hypertension; asthma; diabetes

*P < 0.05

** P < .001

Statistical tests: Chi square and one way analysis of variance.

Using logistic regression, significant predictors of depression using cutoff of 16, indicative of probable depression [31] showed depression was affected solely by gender (being male)($p=.02$), type ($p=.02$), medical history ($p=.05$) and other self-efficacy ($p=.03$) using the enter method to examine variables listed in Table 2; while using a cut-off point of 20, only self-efficacy beliefs for pain ($p=.03$) and other symptoms self-efficacy ($p=.05$) predicted depression when age, gender, type of diagnosis, weight, body mass index, walking distance in 6 minutes, perceived exertion after walking, AIMS scores, VAS score, walking velocity, medical history, and self-efficacy beliefs were entered in step 1.

In support of these observations, significant bivariate correlations observed between the extent of the reported depressive symptoms and the subject's 6-minute walking distance scores ($p=.025$), their fast walking speed scores ($p=.035$), and their pain and other symptoms self-efficacy scores ($p=.005$) as outlined in Table 3. There was no apparent influence of depressive mood as regards perceived exertion scores, gender, body mass, or age.

Table 3. Summary of Key Pearson Correlation Coefficients (r) for Selected Demographic, Clinical and Psychological correlates and Depressive Symptom Scores among Present Sample (N=86)

Variable	Pain		Function		SE	
	VAS	AIMS	FVel	6 min	Pain	Other
CES-D	.280**	.249**	-.265*	-.261*	-.483**	.558**

Abbreviations: AIMS=Arthritis Impact Measurement Scale; CES-D=Center for Epidemiologic Studies Depression Scale; FVel=fast walking velocity; min-minutes; SE=self-efficacy; 6 min-6 minute self-paced walking distance test

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

Figure 1 and Figure 2 also show significant relationships existed between the extent of the reported depressive symptoms as categorized using cut-off scores proposed by Radoff [31] and the degree of confidence expressed for managing pain and other symptoms items on the self-efficacy scale. That is, those with no depressive symptoms (41 or 48% cases) with CES-D scores 0-9, were more confident as a whole than those with mild-moderate degrees of depressive symptoms or CES-D scores of 10-16, and 17-26 (representing 24 or 28.2% and 12 or 14.1% of the sample, respectively) and those 9.4% with more severe symptoms or CES-D scores of 27 or higher, or 9 cases, had lower self-efficacy attributes than those with milder symptoms.

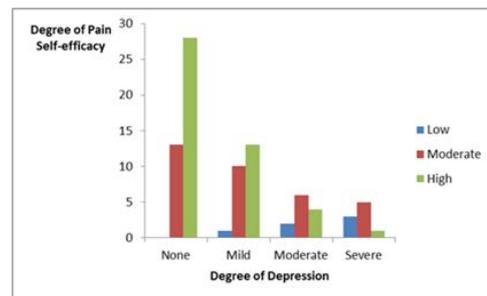


Figure 1. Relationships between extent of depressive symptoms as characterized by Radoff [31] and extent of pain self-efficacy using Chi square (N=86)

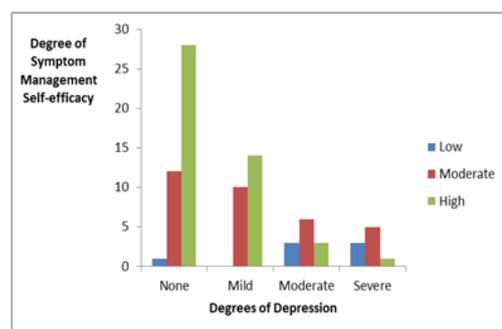


Figure 2. Relationships between extent of depressive symptoms as characterized by Radoff [31] and extent of other symptoms management using Chi square (N=86)

In terms of hypothesis 3, linear regression analysis used to examine the relative relationship of the significant bivariate study variables reported in Table 3, showed self-efficacy for managing osteoarthritis symptoms other than pain was the only significant predictor of these CES-D scores, accounting for 35.4% of the variance in perceived distress ($R^2=.354$) with a standardized beta estimate (β) of $-.422$ ($p=.002$) (See Table 4). Other symptoms self-efficacy scores was predicted by pain self-efficacy ($\text{Beta}=.703$; $p=.001$), R Square=.495, and to a lesser extent by depression ($\text{Beta}=-.285$; $p=.001$) with an R Square of .062, suggesting a possible bi-directional relationship between these variables. All data met criterion for tolerance, variance inflation factors were all lower than 10, and based on an Eigenvalue of 1.95, no multicollinearity problem was evident and results were similar in a subsequent backward stepwise elimination process.

Table 4. Summary of the Standardized Beta Coefficients for Regressing Predictors of Pain, Walking Distance, Walking Velocity, and Self-efficacy Predictor Variables and the Dependent Variable of Depression Severity (N=86)

Total R ²					
		Std Beta	t	p	95% C.I. B
<i>I (Constant)</i>	0.35		5.610	0.001	20.006 - 42.018
<i>Walking distance</i>		-0.171	- 1.196	0.27	-.011 -.003
<i>AIMS</i>		-0.037	- 0.037	-0.70	-1.298 -.950
<i>VAS pain score</i>		0.113	0.956	0.34	397 -1.129
<i>Self-paced velocity</i>		0.11	0.266	0.79	-.452 -.592
<i>Fast velocity</i>		-0.034	- 0.080	0.94	-.521 -.481
<i>Pain self-efficacy</i>		-0.146	- 1.112	0.27	-.191 -.054
<i>Other self-efficacy</i>		-0.42	- 3.158	0.002	-.288 - -.065

Dependent Variable: CES-D score; Std Beta=Standardized Beta Coefficients or effect size; 95% C.I. B=95% Confidence Interval for B Method: Enter

4. Discussion

Knee osteoarthritis, a highly prevalent disabling condition may be affected by a variety of mutable factors including fear, anxiety, lack of confidence, pain catastrophizing, and poor pain coping skills. While elderly people with knee osteoarthritis are not often studied in isolation, consistent with Gleicher et al. [25], and in accord with the first study hypothesis, elders 60 years of age and older presently studied, a reasonably unique sample, reported depressive symptoms at prevalence rates commensurate with those described by Knoop et al. [19], which are of import if one considers that only about 2% of community-dwelling elders commonly suffer from significant depressive symptoms [35]. Yet, none had a depression history, all had relatively mild to moderate, rather than disabling knee osteoarthritis, all were ambulatory, and in fair to good health status with few comorbid conditions and none were being treated for depression even though all were under the care of primary

care practitioners. This latter finding accords with that of Memel et al. [36] who observed that general practitioners often miss diagnosing depression in the patient with osteoarthritis, where the focus is often only the physical aspects of the disease. The finding also concurs with observations of Mattsson and Brostrom [37] for cases of moderate knee osteoarthritis where the condition appeared to have a significant negative impact on psychosocial wellbeing and the data presented in Table 2, using increasingly stringent cut-off points to indicate depressive symptomology, suggests that depression in primary care patients with osteoarthritis is a consequence, rather than a cause of the condition as suggested by Rosemann et al. [38], and is thus possibly preventable and not inevitable.

This is important because, consistent with findings of Kim et al. [39], who emphasized the importance of studying early, rather than late stage knee osteoarthritis, prevailing levels of depressive symptoms were positively correlated with more aversive disease impact and pain experiences, and reduced walking speeds, regardless of age, gender, number of pre-existing medical conditions, or body mass, as observed Mattson and Brostrom [40]. As well, self-efficacy perceptions for controlling pain and managing other condition symptoms, psychological beliefs linked to well-being, and taking the initiative, as well as having persistence, were suboptimal and clearly varied inversely with the depression scores, as well as predicting depressive category using bivariate subgroupings.

Second, although pain is often considered the key factor in explaining why depression might be common in cases of severe painful osteoarthritis [3,41], linear regression analysis of the present data showed the strongest independent predictor of the magnitude of the depressive symptoms among this cohort was their overall perceived self-efficacy scores for controlling their fatigue, pain, feelings of depression, and the frustration of having the condition. Pain self-efficacy status and current pain intensity, which varied with depression symptomology was also influenced by the degree of confidence for managing symptoms, suggesting a person's beliefs about their ability to manage knee osteoarthritis is an especially important cognitive variable that may explain the observed lack of association between radiographic severity and actual pain experiences. Logistic regression using a cut-off score of 20 to denote presence or absence of depression (coded 0 and 1), showed self-efficacy for coping with symptoms other than pain was the strongest and only significant predictor of this subscore, and factors such as gender, extent of osteoarthritis, and body mass had no relationship with depressive symptom prevalence.

Whereas acknowledged limitations to the present study include the research design, the use of non-probability convenience sampling, the inclusion of those who were proficient in English, the small sample size, the limited number of males, as well as the use of subjective self-reports to assess key constructs, and the fact no specific diagnostic tools were available to verify patients were suffering from depression, our data were obtained using validated testing instruments, all subjects completed all tests, there were no missing data, and all statistical assumptions for tests generated were met. As well, the sample demographics comported quite well with those reported in other studies, including those reflecting age,

body mass, and gender distribution, suggesting the results might be applicable to others with similar characteristics [46]. Moreover, the finding of significant associations in the direction predicted, suggests the sample size had enough power to detect clinically meaningful associations. In addition, although there were clearly fewer men than women in this sample, gender was not a significant predictor of rates of depressive symptoms reported in this study, which is consistent with Alkan et al. [3].

Although our present findings may not be generalizable, the observation that at least 20% of the present sample reported mild-severe symptoms of depression, even though none had a history of depression, is consistent with findings of Knoop et al. [19] of a possible depressive phenotype among adults with knee osteoarthritis. Employing the Radoff criteria and those discussed by Penninx et al. [35] the findings are also consistent with those of Summers et al. [42] and Rosemann et al. [43] and previous findings showing depressive symptoms are strongly related to higher pain levels [19], poorer functional capacity, and perceived impact of the disease [20,44,45]. In addition, even though no clinical diagnosis was forthcoming to validate whether participants were depressed, as pointed out by Knoop et al. [19], depression which was based on the score on the Center for Epidemiologic Studies Depression Scale (CES-D) questionnaire is one of the most frequently used questionnaires for depressive experiences with very strong psychometric properties [31], where a sum score of 16 on a 0-60 scale is indicative of mild depression and a score of 27 is indicative of major depression [60].

Importantly, those with more severe depressive symptoms were clearly experiencing higher pain levels, and more disability than those with milder symptoms or no symptoms, which is consistent with observations of Kim et al. [39] for patients with minimal to moderate radiographic severity, where coexisting depression was associated with knee pain. The presence of depressive symptoms, while often linked to the presence of comorbid conditions in the elderly [38] was clearly not a factor in this exploration where the majority of the cohort were free of comorbid diseases, and suggests knee osteoarthritis alone can inflict significant mental as well as physical health challenges on an individual, that may reinforce each other, even if this is not widely acknowledged in clinical practice. Moreover, the magnitude of the prevailing depressive symptoms impacted the individual's confidence beliefs adversely, and although body mass indices were unrelated to the cohort's composite depressive score, body mass was higher among those categorized as being mildly depressed [31], and may serve as a early risk factor for more severe depression [38].

Thus, even though Creamer et al. [47] found no significant depression among cases they studied with medio-lateral knee osteoarthritis, as was the case in the paper by White et al. [46], the present results imply that the presence of depressive symptoms should be routinely sought by clinicians who treat older adults with knee osteoarthritis, so they can intervene accordingly to prevent excessive functional [35], as well as cognitive declines that can otherwise be predicted among community dwelling elders [32] as outlined by Axford et al. [48]. Although our cross sectional study clearly cannot infer causality, recent findings by Ozcakir et al. [49] of a

significant correlation between radiological severity and depression among adults diagnosed as having knee osteoarthritis stresses the need to raise awareness in this respect so that depression does not go undiagnosed and untreated.

As well, given that depression impacts life quality [5], surgery to replace the diseased knee joint [27], disability and perceived health in older adults with osteoarthritis [50], and that perceived helplessness may play a crucial role in mediating these adverse events [56], the current findings also imply that among the targets or avenues of intervention to forestall disability, a focus on pain treatments alone often thought to predict depression may not suffice. Instead, to improve outcomes, the identification of less than optimal self-efficacy, a known risk factor for functional declines [51] and adherence problems [54] followed by interventions to boost this, may prove of greater value than simply trying to focus on pain alone (See Tables 2-3 and Figures 1-3). This perspective is also consistent with a study of community-dwelling older adults with symptomatic hip or knee osteoarthritis where depression was a strong feature of cases with pain, as well as fatigue, and where it was concluded there may be important central nervous system contributions to these symptoms such as perceived self-efficacy that may be modifiable though intervention that have not received adequate attention in the clinical literature [52].

In addition, due to the weight gain associated with depression, and use of certain depression related medications, preventing the onset or severity of depression through means other than medication, for example by building self-efficacy beliefs, and reducing pain, may be highly important as well, given this group presently studied was already overweight, on average. Furthermore, although little has been done previously to examine the interrelationships of psychological and physical factors among older osteoarthritic adults [41], research suggests attempts to examine, and minimize the onset of any depressive feelings may be paramount in the context of increasing opportunities to promote more leisure time activities [52], walking capacity [53], and to reduce pain [57] that could help with weight control.

5. Conclusion

In accord with Mattson and Brostrom [40], the present results indicate a sizeable percentage of older adults with mild to moderate knee osteoarthritis may be experiencing unrecognized symptoms of depression that range from mild to severe. In addition to impacting the pain experience, those who report depressive symptoms may experience greater mobility challenges than those who do not [59]. In accord with studies detailing the nature of depression in patients with chronic pain [55], those with lower self-efficacy beliefs for carrying out self-management activities are more likely to report more frequent depressive symptoms than those with a high degree of self-efficacy. More specifically, self-efficacy beliefs regarding symptom management appear to uniquely predict the presence and magnitude of experiencing a depressed mood. Since those with depressive symptoms also had higher degrees of disability, on average, than those without depressive symptoms, it

seems reasonable to suggest that more efforts to identify and treat depression, plus interventions to build a patient's confidence to manage their disease symptoms, a predictor of surgical outcomes for knee osteoarthritis [58] may be highly important strategies for optimally reducing the magnitude of disability experienced by older knee osteoarthritis cases with stages 1 or 2 of the disease living in the community. Since knee osteoarthritis can be extremely disabling, and its progression is not easy to retard by any present approach, future screening studies as well as well-designed a study replicating this one with a larger sample size, to testify to the findings, given that parameters such as age and body mass index may not conform to a normal curve distribution, plus prospective studies of diverse samples to examine if early efforts to prevent or treat depressive symptoms and/or to heighten self-efficacy can heighten allay the progression of the disease are recommended. In particular, examining which domains of the CES-D are most problematic among knee osteoarthritis patients who appear to feel depressed, as well as examining which self-efficacy items appear most challenging may be extremely revealing. In the interim, a pathway that may enhance outcomes of early stage knee osteoarthritis is outlined in Figure 3 and should be investigated, as well.

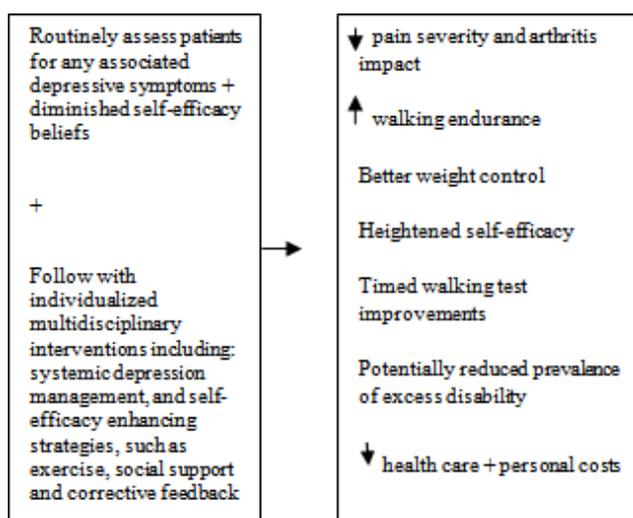


Figure 3. Theoretical framework depicting potential outcome of routine assessment and targeted rehabilitation efforts for adults with mild to moderate knee osteoarthritis

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