# Knee problems: prevalence and need for a better follow-up in a kinesiology clinic.

**Stéphane NORTHON, B. sc.**[1,2], **Karine BOIVIN, Ph.D.**[1,2] and **Louis LAURENCELLE, Ph.D.**[1],
[1] Département des sciences de l'activité physique de l'Université du Québec à Trois-Rivières (UQTR),
[2] Groupe de recherche sur les affections neuro-musculo-squelettiques (GRAN)

*Corresponding author*
*Université du Québec à Trois-Rivières*
*Département des sciences de l'activité physique*
*Karine Boivin*
*P.O Box 500*
*3351 Boulevard des Forges*
*Trois-Rivières, Qc*
*G9A 5H7*
*Tel no. (819) 376-5011 ext. 3778*
*Fax no. (819) 376-5092*
*E-mail address : karine.boivin@uqtr.ca*

Running title: Knee problems: demographic portrait in a clinical setting

Article submitted on: November 5th, 2014

About the authors:

Stephane Northon, B. sc., M. sc. candidate in physical activity sciences with a biomechanics specialty and is involved in projects regarding knee functions.

Dr. Karine Boivin, Ph.D., in biomedical engineering, professor in Département des sciences de l'activité physique, Université du Québec à Trois-Rivières, teaches and acts in the fields of musculoskeletal anatomy and biomechanics. Her main research interests pertain to biomechanical assessment and rehabilitation of the lower limb, gait analysis, aging effects on motor functions and metrology.

Dr. Louis Laurencelle, Ph.D., associate professor in Département des sciences de l'activité physique, Université du Québec à Trois-Rivières, teaches and acts as consultant in research methodology, applied statistics and psychometrics. His main research interests pertain to data mining and transformation techniques and to developing statistical and probabilistic aspects of classical test theory.

Traumas affecting the lower limb and knee are widespread and physical activity is recognized today as a good recommendation for various knee problems. We estimated the prevalence and demographic features of people with knee problems among the clientele of a kinesiology clinic in a university campus in order to assess needs in the rehabilitation program and sustain follow-up. The sample was divided in two groups: Knee problems and Control, the Knee problems subsample numbering 38.3% (54 cases) of available files. Demographic features did not differ significantly between the two groups. Reasons for consultation were primarily physical fitness, neuromusculoskeletal problems and general health or weight control. Only 57% of the Knee problems subsample reported having consulted one health professional or more for their knee problem. Participation in a regular weekly physical activity while reporting knee pain in daily life was present in 82% of the Knee problems subsample. While prevalent in the kinesiology clinic, only half of people with knee problems were followed by a health professional even if pain is reported. Since the kinesiological approach is mostly based on movement, concomitant assessment of the knee's function during a motor task appears to be a pertinent asset for individualized and specialized exercise follow-up program.

Keywords: knee symptoms, physical activity, kinesiology, clinical setting

# 1. INTRODUCTION

Knee problems, whether they involve pain or other symptoms such as giving-way, locking or being unstable, are a common source of functional limitations [19]. Their origin can be traumatic, such as blunt or sprain injuries, or idiopathic, where factors responsible for the symptomatology are either multiple or unknown. In the province of Quebec, traumatic injuries affected the knee and shin in 19.3% of all sports-related traumas in 2004 [7]. It is also known that physical traumas affecting the knee greatly increase the odds of suffering from knee osteoarthritis later in life [15]. Nearly half of those with a diagnosed anterior cruciate ligament or meniscus tear will have knee osteoarthritis with functional impairment 10 to 20 years after the diagnosis [12]. Knee osteoarthritis is the most common form of idiopathic knee pathology [11] with a prevalence estimated at 10% of the adult population in Western societies [10] and is a major cause of disability-adjusted-life years [2]. The prevalence is higher in females, especially after menopause [16], but it increases in both sexes dramatically past 60 years old [5]. Its socio-economic impact is large, with an average annual burden of 12 200$ per patient in 2002 Canadian currency [6]. End-stage osteoarthritis may lead to knee arthroplasty which, in Canada, has occasioned a total of 37 943 hospitalizations (Quebec data not in the study) in 2006-2007 [3], a growth of 140% comparatively to 1996-1997.

Physical activity has been found to be protective, assuming further injuries are avoided [1], with an effect size for pain similar to non-steroidal anti-inflammatory drugs (NSAIDS) [8] and it is often recommended by the medical community in order to improve knee function [21]. Health professionals involved in physical activity prescription, such as kinesiologists, must take into consideration the problems reported by their clients such as knee pain and its impact on the knee's function in order to adapt their exercise prescription.

The purpose of this study was to obtain a profile of the clientele in the context of a kinesiology clinic. The study had three specific objectives: 1) estimate the local prevalence of knee problems, 2) compare demographic data and reasons for consultation between people with and without knee problems and 3) observe the propensity of people with knee problems in regard to health consultation and physical activities. These results would enable us to evaluate the need to develop specific interventions for a better prevention or alleviation of knee problems.

## 2. METHODOLOGY

All client files located at the Clinique de Kinésiologie de l'Université du Québec à Trois-Rivières were screened for a year, starting from the clinic's opening to the public (September 2010 to 2011), for a total of 150 files. Data of interest were gathered from the anamnesis transcript, a standardized verbal interview previously realized by interns, plus the first question of a modified *Questionnaire d'aptitude à l'activité physique* (Q-AAP): "Votre dernier examen médical complet remonte-t-il à plus de deux ans?", freely translated to "Is your last full medical exam more than two years old? ". This last question was used to determine the general medical follow-up. The file exclusion criterion was the absence of a completed anamnesis. Nine files found incomplete at the screening date, were discarded.

The remaining 141 files were further screened for our variables of interest: knee problems (KP), body mass index (BMI), reason for consultation (RC), health-related follow-up, health professional and physical activity habits. The obtained list of reasons for consultation contained 139 completed files[1] totaling 196 reasons: some 45 files mentioned multiple reasons (two reasons: 36 files, three reasons: 6 files, four reasons: 3 files). We first reduced the list to fifteen

[1] Data missing for 2 files.

subgroups regrouping similar reasons. The six following categories were then created by regrouping subgroups with related items together : kinesthesia (proprioception, posture, stability, movement-related qualities), high level physical activities (sportive or goal-oriented), general health or weight control (evaluation, weight management, health and well-being), physical fitness (physical qualities, fitness increase or maintenance, individual or adapted approach), pain or neuromusculoskeletal (NMS) problem (pain, articular or soft tissue problem and rehabilitation) and a residual group that contained files with multiple items that pertained to more than one category. All items were then distributed as individual units, whether appearing alone or in a group of reasons, and the resulting proportions were compiled. The number of appearance in the reasons for consultation of the words “knee”, “back”, “shoulders” and “neck” was appraised. To clarify the presence of knee problems, we created a hierarchical criterion model (Fig. 1). Files that mentioned knee pain, other knee symptoms (e.g. knee-locking) or a past diagnosed knee trauma (e.g. meniscus tear) were assigned to the knee problems (KP) group. Files that did not mention knee pain, knee symptoms or a past diagnosed knee trauma were classified as the control group (CTL). The following two variables presented interest for the KP group only: health professional and physical activity practice.

The health professionals were divided into four subgroups: general practitioner, medical specialist, paramedical practitioner (physical therapist, occupational therapist) and alternative medicine (massage therapist, chiropractor, acupuncturist or osteopath). In order to determine the status of health-related follow-up for the KP group, we developed another criterion model (Fig. 2). To be considered as having no regular follow-up, two conditions had to be met: first, having no mention of knee health-related visit in the transcript and second, responding “Yes” to the first Q-AAP question “(Is your last complete medical examination more than two years old?”, free translation). The range of the BMI results was broken down into three categories for all files: <25

kg/m² (underweight and acceptable weight), 25 to 29.9 kg/m² (overweight), ≥30 kg/m² (obese), in accordance with Statistics Canada's convention [17]. The category underweight was fused with normal weight since it accounted only for 3 borderline cases. Physical activity was appraised for the KP group and participants were distributed among three categories: sedentary (less than one significant physical exertion per week), weekly active (at least once per week or a combination of several physical activities) and competitive (sustained, weekly high-level physical activities or sport-specific routine). Unpaired *t*-tests on the demographic variable were performed to compare the two subgroups (KP and CTL). Adjusted chi square ($\chi^2$) tests were used for reasons for consultation data and qualitative appreciations were done on the remaining variables of the KP group.

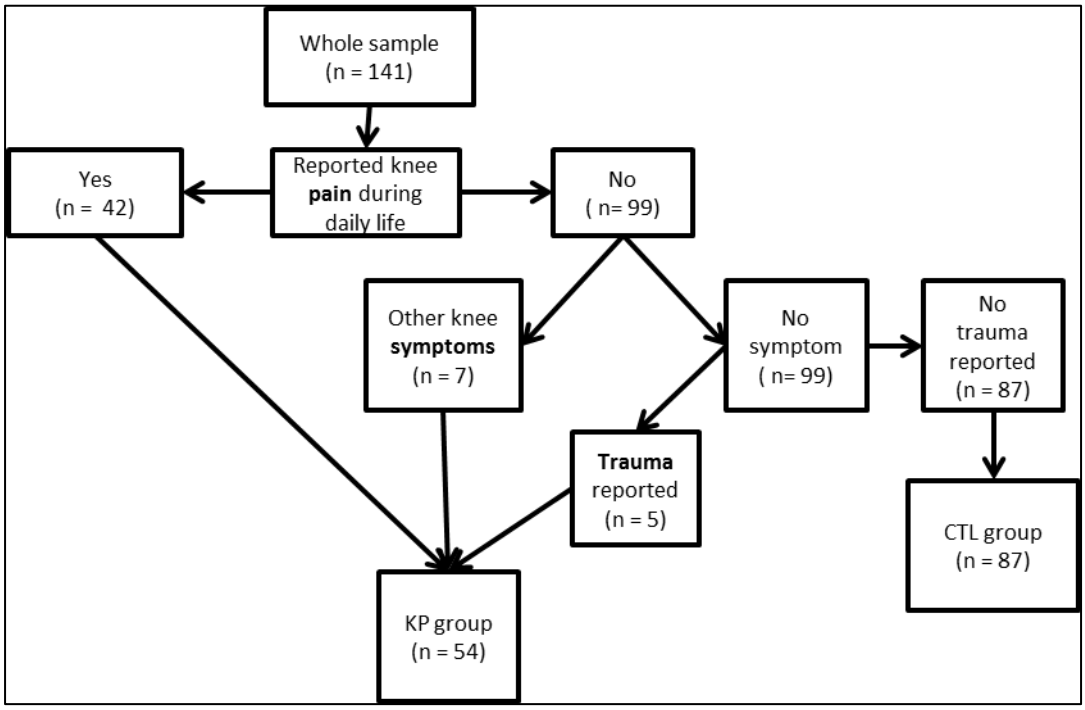


Figure 1. Hierarchical criteria model to determine the presence of knee problem

KP group: Knee problem group, CTL group : Control group.

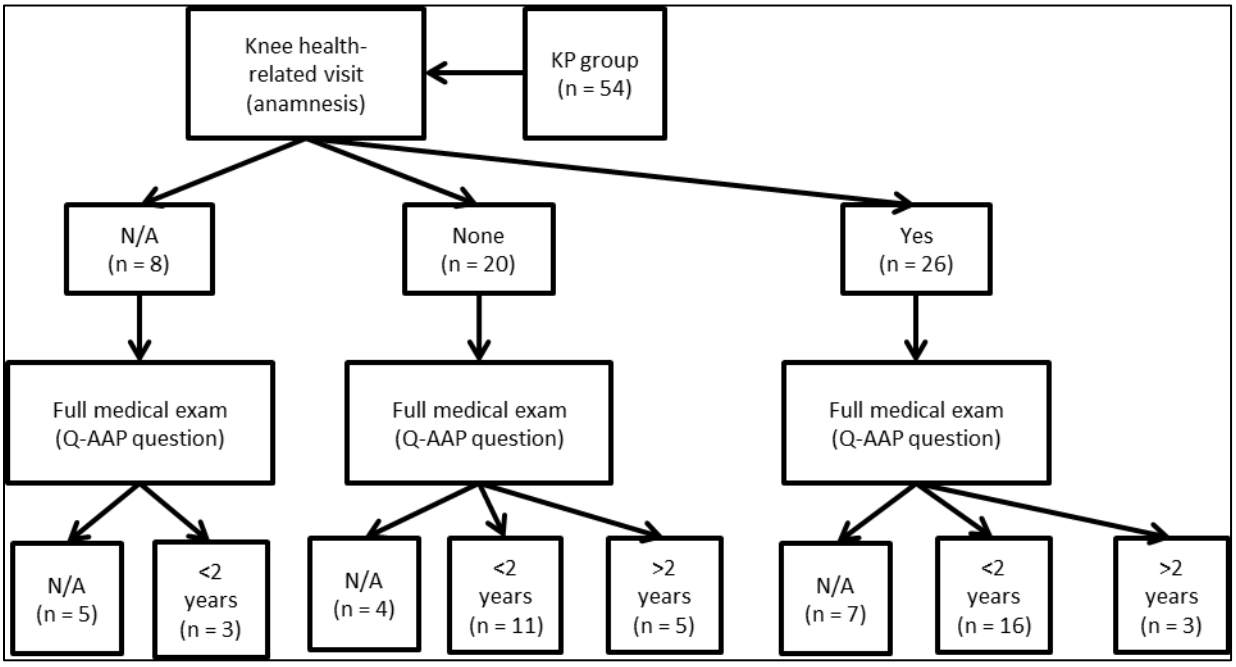


Figure 2. Hierarchical criteria model to determine the health follow-up in those with a knee problem (KP group).

## 3. RESULTS

The demographic data are presented in Table 1. Of the 141 completed files, 54 files (38.3%) were included in the KP group and 87 files (61.7%) figured in the CTL group. There were no statistically significant differences between the KP and the CTL groups on the demographic variables. Based on the mean BMI, our total sample was considered as overweight (BMI = 26.36kg/m$^2$ ± 0.49). The main reasons for consultation were: physical fitness (KP: 40%, CTL: 46%), pain or neuromusculoskeletal problem (KP: 31%, CTL: 20%), and general health or weight control (KP: 19%, CTL: 23%) (Fig. 3). The word “knee” was mentioned 20 times, “back”, 19 times, and other regions were much less frequent (e.g. “shoulders”, 8 times). Knee pain was reported in 43 of the 54 KP files (79.63%), while the remaining files were either other

symptoms (6 files, 11.11%) or past knee trauma (5 files, 9.26%). A total of eight files (18.6%[2]) in the KP group did not have a full medical exam in the last two years and knee health-related consultations were present in only 26 files (56.5%[3]). Combining the last two variables shows that 16 files (37.2%[2]) were followed both generally and specifically for the knee problem and only five files (11.6%[2]) did not have any health follow-up. A general practitioner was mentioned in half (13 / 26) of the knee-related follow-up, paramedical in 35% (9 / 26), an alternative medicine practitioners in 27% (7 / 26), and finally, a medical specialist in 23% (6 / 26) of the files. Thirty-two (32) files (66.67%) in the KP group were classified as weekly active, 10 (20.83%) did not report participating in any physical activities (sedentary) and finally, 6 (12.5%) were considered as competitive. As shown in figure 4, pain and physical activity data shows that files classified as sedentary mentioned knee pain in nine files out of ten (90%), weekly active in 26 out of 32 (82%) and competitive in four out of six (67%).

Table 1. Distribution of demographic variables of the sample issued from the kinesiology clinic.

| **Demographic variables** | **Groups** | | |
|---|---|---|---|
| **Files (n)** | All (141) | KP (54) | CTL (87) |
| **Age (years)** | 34.53 (±1.3) | 34.54 (±2.23) | 34.53 (±2.23) |
| **Weight (kg)** | 72.53 (±1.49) | 70.82 (±2.49) | 73.3 (±1.87) |
| **Height (m)** | 1.66 (±0.01) | 1.65 (±0.01) | 1.67 (±1.66) |
| **BMI (kg/m²)** | 26.36 (±0.49) | 25.8 (±0.86) | 26.53 (±0.6) |

KP group: Knee problem, CTL group : Control group, BMI = Body mass index. Unpaired *t*-test sample found no significant differences on demographic variables at $p = 0.05$.

[2] Data available in 43 files from the 54 initial KP files.
[3] Data available in 46 files from the 54 initial KP files.

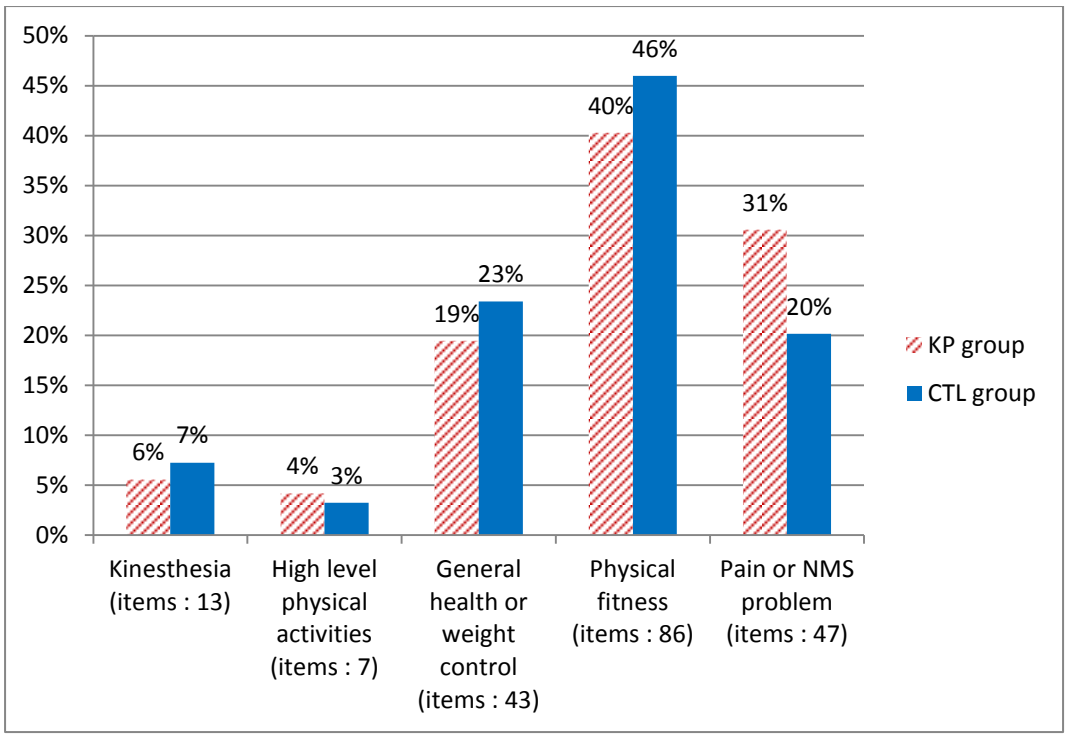


Figure 3. Distribution of the reasons for consultation (n= 139 files, 196 items).

NMS: neuromusculoskeletal. KP (knee problem group): 72 items, CTL (control group): 124 items. Adjusted khi² test found no significant differences ($p$ >0.05).

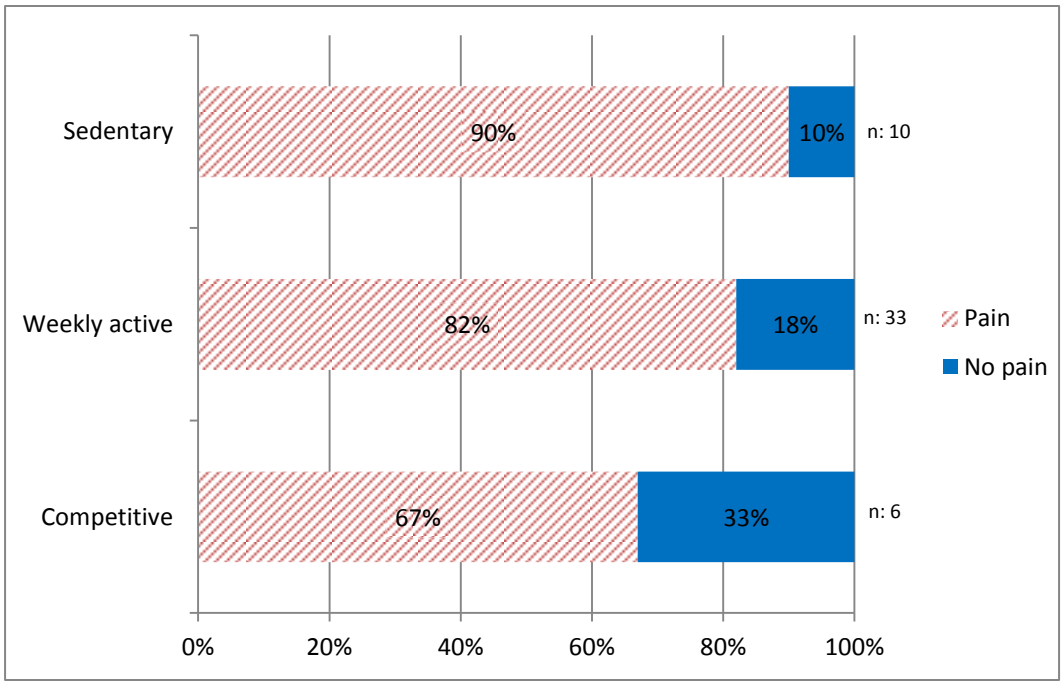


Figure 4. Physical activity distribution and the proportion of files reporting pain vs no pain among the KP group. Qualitative appreciation done on the KP group only. 49 files were completed for the physical activity aspect.

## 4. DISCUSSION

The purpose of this study was to obtain a profile of the clientele in the context of a kinesiology clinic to evaluate the need to assess specifically the knee's state and function for a better prevention or alleviation of knee problems of symptomatic people. The commonest reason for consultation in our total cohort was physical fitness as expected. This is, we speculate, partly due to the general public's perception that kinesiologists are not primary actors in a therapeutic context, but rather work in health promotion, injury prevention and occasionally in therapeutic follow-up. Still, a good proportion (24%) of files mentioned pain or a neuromusculoskeletal reason for consultation, which shows belief in the kinesiological approach for muscular or soft-tissue ailments. The word "knee" was found in 20 files, with the word "back" coming in second

with 19 mentions, while other regions were much less frequent (e.g. shoulders, 8 files). Most interestingly, our data show that knee problems are common in the context of a kinesiology clinic, with 38% of the files substantiating it; among those, 43.5% were not seen in the context of a knee health-related follow-up. These results show similarities with Thorstensson's (2009) [18], based on a larger cohort (n = 1119), where 55% of their subjects had not consulted two years prior to the study for their hip and/or knee osteoarthritis-related pain. Their study has found that the strongest determinants for knee pain related health consultations were, in decreasing odds: mobility problems, obesity (BMI >30 kg/m²), and having three or more health problems. The presence of pain was also significant but with a much smaller ratio. Thorstensson's results corroborate ours and highlight the high proportions of people mentioning the absence of knee-specific follow-up. This fact is relevant for the kinesiologic practice considering that the intervention focuses on movement.

The body mass index (BMI) is a well-known risk factor for the onset and progression of knee osteoarthritis [14-20]. In our study, although no statistically significant difference was found between the two groups for the BMI, the whole sample was classified as overweight. The evidence that the clientele of the kinesiology clinic is overweight, which accentuates the articular forces due to weight-bearing, brings attention to the need for a precise knee follow-up in a physical activity set-up. International experts have put forward the relevance of the assessment of the biomechanics of the knee in dynamic context as a beneficial type of evaluation for better prevention and clinical follow-up [9],[4]. The relevance of biomechanical factors as a risk factor for the development of knee OA is mentioned by many authors in the literature. Regular evaluation protocols in knee problems revolve around medical imagery techniques, v.g radiography and magnetic resonance imagery. Both present the same limitations for the knee, i.e.

lack of information while weight-bearing in a movement context. Objective information about the knee's function during motor task would ensure health professionals that no further damage is being done during exercise follow-ups. Recently, a model that allows the assessment of the knee's biomechanics has been developed. By precisely quantifying the three dimension movements that occur at the knee during walking, it has been validated both as a prevention and follow-up tool for patients with knee problems [13].

Some limitations of our study must be noted. First of all, the files were retrospective, indigenous to the clinic and had not been created for a research purpose. Thus, the investigation could not go farther than what is written in the files. Being unable to comply with norms made by the Canadian Society of Exercise Physiology, we had to develop our own "standardized" approach for the determination of physical activity status.

## 5. CONCLUSION

Our research indicates that knee problems are widespread in a kinesiology clinic context, that pain is a common symptom for the sedentary and weekly active alike. Considering that physical activity is recommended in the literature in the absence of further injury and excessive joint loading, kinesiologists must adapt their prescription of exercises to knee deficit in clients since their intervention includes dynamic components (e.g. walking). As such, objective assessment of the knee's function during a motor task (e.g. biomechanical assessment) would give factual information valuable to both the client and the kinesiologist in the context of a therapeutic follow-up.

ACKNOWLEDGMENT:

We would like to thank the staff at the Clinique de Kinésiologie de l'Université du Québec à Trois-Rivières for the technical support and the Université du Québec à Trois-Rivières for the financial support.

REFERENCES :

[1]. Bosomworth, N. J. (2009). Exercise and knee osteoarthritis: benefit or hazard? *Can Fam Physician, 55*(9), 871-878

[2]. Brooks, P. M. (2006). The burden of musculoskeletal disease--a global perspective. *Clin Rheumatol, 25*(6), 778-781

[3]. Canadian institute for health information (CIHI). (2009). Hip and Knee Replacements in Canada—Canadian Joint Replacement Registry (CJRR) 2008–2009 Annual Report. 88 p. Retrieved on January 20, 2013 from https://secure.cihi.ca/estore/productFamily.htm?pf=PFC1063&lang=en&media=0

[4]. Chang, A., Hochberg, M., Song, J., Dunlop, D., Chmiel, J. S., Nevitt, M., et al. (2010). Frequency of varus and valgus thrust and factors associated with thrust presence in persons with or at higher risk of developing knee osteoarthritis. *Arthritis Rheum, 62*(5), 1403-1411

[5]. Felson, D. T., Naimark, A., Anderson, J., Kazis, L., Castelli, W., & Meenan, R. F. (1987). The prevalence of knee osteoarthritis in the elderly. The Framingham Osteoarthritis Study. *Arthritis Rheum, 30*(8), 914-918

[6]. Gupta, S., Hawker, G. A., Laporte, A., Croxford, R., & Coyte, P. C. (2005). The economic burden of disabling hip and knee osteoarthritis (OA) from the perspective of individuals living with this condition. *Rheumatology (Oxford), 44*(12), 1531-1537

[7]. Hamel, D. G., C. (2006). Étude des blessures subies au cours de la pratique d'activités récréatives et sportives au Québec en 2004. 102 p. Retrieved on January 21, 2013 from http://www.inspq.qc.ca/pdf/publications/520-BlessuresActivitesSportives.pdf

[8]. Henrotin, Y., Marty, M., Appelboom, T., Avouac, B., Berenbaum, F., & Briole, V., Djian P. (2009). French translation of the Osteoarthritis Research Society International (OARSI) recommendations for the management of knee and hip osteoarthritis. *Revue du Rhumatisme, 76*, 279-288

[9]. Hunt, M. A., & Bennell, K. L. (2011). Predicting dynamic knee joint load with clinical measures in people with medial knee osteoarthritis. *Knee, 18*(4), 231-234

[10]. Kopec, J. A., Rahman, M. M., Berthelot, J. M., Le Petit, C., Aghajanian, J., Sayre, E. C., et al. (2007). Descriptive epidemiology of osteoarthritis in British Columbia, Canada. *J Rheumatol, 34*(2), 386-393

[11]. Lawrence, R. C., Felson, D. T., Helmick, C. G., Arnold, L. M., Choi, H., Deyo, R. A., et al. (2008). Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum, 58*(1), 26-35

[12]. Lohmander, L. S., Englund, P. M., Dahl, L. L., & Roos, E. M. (2007). The long-term consequence of anterior cruciate ligament and meniscus injuries: osteoarthritis. *Am J Sports Med, 35*(10), 1756-1769

[13]. Lustig S, M. R., Cheze L, Neyret P. (2012). The KneeKG™ system: a review of the literature. *Knee Surg Sports Traumatol Arthrosc, 20*(4), 633

[14]. Murphy, L., & Helmick, C. G. (2012). The impact of osteoarthritis in the United States: a population-health perspective: A population-based review of the fourth most common cause of hospitalization in U.S. adults. *Orthop Nurs, 31*(2), 85-91

[15]. Roos, E. M. (2005). Joint injury causes knee osteoarthritis in young adults. *Curr Opin Rheumatol, 17*(2), 195-200

[16]. Srikanth, V. K., Fryer, J. L., Zhai, G., Winzenberg, T. M., Hosmer, D., & Jones, G. (2005). A meta-analysis of sex differences prevalence, incidence and severity of osteoarthritis. *Osteoarthritis Cartilage, 13*(9), 769-781

[17]. Statistics Canada. (2011). CANSIM Table 105-0501: Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2011 boundaries) and peer groups. Retrieved on January 19, 2013 from http://www5.statcan.gc.ca/cansim/a05?lang=fra&id=1050501#F40

[18]. Thorstensson, C. A., Gooberman-Hill, R., Adamson, J., Williams, S., & Dieppe, P. (2009). Help-seeking behaviour among people living with chronic hip or knee pain in the community. *BMC Musculoskelet Disord, 10*, 153

[19]. White, D. K., Felson, D. T., Niu, J., Nevitt, M. C., Lewis, C. E., Torner, J. C., et al. (2011). Reasons for functional decline despite reductions in knee pain: the Multicenter Osteoarthritis Study. *Phys Ther, 91*(12), 1849-1856

[20]. Wills, A. K., Black, S., Cooper, R., Coppack, R. J., Hardy, R., Martin, K. R., et al. (2012). Life course body mass index and risk of knee osteoarthritis at the age of 53 years: evidence from the 1946 British birth cohort study. *Ann Rheum Dis, 71*(5), 655-660

[21]. Zhang, W., Moskowitz, R. W., Nuki, G., Abramson, S., Altman, R. D., Arden, N., et al. (2008). OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage, 16*(2), 137-162

TABLE CAPTIONS

Table 1. Distribution of demographic variables of the sample issued from the kinesiology clinic.

FIGURE CAPTIONS

Figure 1. Hierarchical criteria model to determine the presence of knee problem

Figure 2. Hierarchical criteria model to determine the health follow-up in those with a knee problem (KP group)

Figure 3. Distribution of the reasons for consultation

Figure 4. Physical activity distribution and the proportion of files reporting pain vs no pain among the KP group.