UNIVERSITÉ DU QUÉBEC À TROIS-RIVIÈRES

L'ÉTUDE DE L'EFFICACITÉ ET DES TRAJECTOIRES DE CHANGEMENT DES INTERVENTIONS AUTO-ADMINISTRÉES BASÉES SUR LA THÉRAPIE D'ACCEPTATION ET D'ENGAGEMENT POUR LA DOULEUR CHRONIQUE

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Sommaire

La douleur chronique est l'un des problèmes de santé aux conséquences les plus sous-estimées dans le monde. Pourtant, cette condition de santé affecte tous les domaines de la vie d'une personne et engendre des coûts importants sur le plan de la santé publique. À l'heure actuelle, il existe plusieurs obstacles sur le plan de l'accès aux soins (p. ex., de longues listes d'attente, les coûts financiers) et avec la pandémie de la COVID-19, ces problèmes ont été exacerbés. Ainsi, les interventions auto-administrées, c'est-à-dire offertes par l'entremise d'un livre, d'une plateforme Web ou d'une application mobile, s'avèrent une option intéressante, car elles peuvent être facilement accessibles et à faible coût. Toutefois, étant donné que ces interventions sont plutôt nouvelles, leur efficacité doit être mieux démontrée empiriquement. De plus, nous en connaissons très peu sur les trajectoires de changements de ces interventions dans le temps et les caractéristiques des personnes qui en bénéficient le plus. L'objectif de cette thèse est double. D'une part, elle vise à évaluer l'efficacité d'un traitement basé sur la thérapie d'acceptation et d'engagement (ACT) auto-administré pour la douleur chronique en comparant deux différents formats (la bibliothérapie et une plateforme Web) à un groupe contrôle actif recevant de l'éducation sur la douleur. D'autre part, elle a comme objectif d'examiner les différentes trajectoires de changements durant ces interventions et d'identifier des caractéristiques et prédicteurs des individus qui répondent bien ou moins bien à ces interventions. Les données issues de cette thèse proviennent d'un essai randomisé contrôlé effectué auprès de 297 adultes souffrant de douleur chronique visant à comparer deux différents formats d'interventions auto-administrées basés sur l'ACT, soit une intervention menée via une plateforme Web et une autre via la lecture d'un livre (bibliothérapie) à un

groupe contrôle actif recevant de l'éducation sur la douleur. La variable primaire est l'incapacité reliée à la douleur et les variables secondaires sont la dépression, l'anxiété et la qualité de vie. Les participants ont complété des questionnaires autorapportés à quatre différents temps de mesure (pré-test, post-test et suivis à 3 et 6 mois). Les résultats de la première étude démontrent des effets principaux statistiquement significatifs pour le temps pour l'incapacité reliée à la douleur (F = 15,15, p = 0,000), la dépression (F = 6,82, p = 0,000), l'anxiété (F = 4,88, p = 0,003), et la qualité de vie (F = 6,85, p = 0,000) pour les trois interventions, avec des tailles d'effet faibles. Toutefois, aucune différence significative n'a été observée entre les trois groupes (effet d'interaction). La seconde étude présente l'analyse des trajectoires de changements qui utilisent de plus des questionnaires hebdomadaires pendant la durée de l'intervention. Les résultats révèlent quatre trajectoires distinctes (AIC = 4477,8; BIC = 4518,3) avec différents taux de changements à travers le temps. Dans l'ensemble, les résultats démontrent que des niveaux plus faibles d'incapacité liée à la douleur et d'anxiété ainsi que des niveaux plus élevés de qualité de vie, de flexibilité psychologique et d'efficacité personnelle au pré-test sont des prédicteurs de meilleurs résultats thérapeutiques. De plus, le groupe auquel est attribué les participants est associé à l'appartenance aux trajectoires [X^2(6, N = 217) = 18,10, p = 0,006]. Plus précisément, il est plus probable que les participants dans la trajectoire avec un degré plus faible d'incapacité à la douleur soient dans le groupe bibliothérapie [OR(95%IC) = 2,0] et que les participants dans la trajectoire très élevée et stable avec le temps soient dans le groupe Web [OR(95%IC) = 2,3]. Les résultats des deux études sont discutés, incluant les limites, les implications cliniques et des pistes de recherche futures.

Summary

Chronic pain is one of the most underestimated health issues worldwide. This condition, however, affects all aspects of a person's life and imposes a significant burden on public health systems. Several barriers currently limit access to care (e.g., long waiting lists, financial costs), challenges that have been further exacerbated by the COVID-19 pandemic. Thus, self-administered interventions—delivered through a book, a web platform, or a mobile application—represent an appealing, cost-effective, and accessible option. However, given the relative novelty of these interventions, further empirical evidence is needed to establish their effectiveness. Furthermore, little is known about the trajectories of change over time and the individual characteristics that predict better outcomes in such interventions. This thesis is based on data from a randomized controlled trial involving 297 adults with chronic pain. The study compares two formats of self-administered ACT-based interventions—one via a web platform and the other through bibliotherapy—against an active control group receiving pain education. The primary outcome is pain-related disability, with secondary outcomes including depression, anxiety, and quality of life. Participants completed self-reported questionnaires at four different time points: pre-test, post-test, and follow-ups at 3 and 6 months. Results from the first study indicate statistically significant main effects over time for pain-related disability ($F = 15.15$, $p < .001$), depression ($F = 6.82$, $p < .001$), anxiety ($F = 4.88$, $p = .003$), and quality of life ($F = 6.85$, $p < .001$) across all three interventions, though with small effect sizes. However, no significant interaction effects were observed between the groups. The second study identifies four distinct trajectories ($AIC = 4477.8$;

BIC = 4518.3), each characterized by different rates of change over time. Overall, the findings suggest that lower baseline levels of pain-related disability and anxiety, along with higher levels of quality of life, psychological flexibility, and self-efficacy, predict better therapeutic outcomes. Moreover, participants' group assignment was significantly associated with trajectory membership [$\chi^2(6, N = 217) = 18.10, p = .006$]. Specifically, participants with lower pain-related disability were more likely to belong to the bibliotherapy group [*OR* (95% CI) = 2.0], whereas those in the trajectory characterized by very high and stable disability over time were more likely to be in the web-based intervention group [*OR* (95% CI) = 2.3]. The findings of both studies are discussed in relation to their limitations, clinical implications, and future research directions.

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Introduction générale

La psychologie occupe un rôle important dans la gestion de la douleur chronique mais l'accès aux interventions psychologiques demeure un problème majeur. Ainsi, les interventions auto-administrées s'avèrent prometteuses car en plus de faciliter l'accès, elles offrent un rapport coût-bénéfice avantageux. L'objectif de cette thèse est d'évaluer l'efficacité des interventions auto-administrées basées sur la thérapie d'acceptation et d'engagement (ACT) pour la douleur chronique et de mieux comprendre les trajectoires de changement associées à l'incapacité reliée à la douleur chronique chez les individus participant à ces interventions. Cette thèse doctorale comprend une introduction générale, deux articles scientifiques et une conclusion générale. L'introduction générale vise à introduire les principales notions des deux études. Plus précisément, elle présentera la problématique de la douleur chronique, un survol des psychothérapies existantes pour la douleur chronique avec un accent sur l'ACT et le modèle de flexibilité psychologique. De plus, un survol de l'état actuel des connaissances sur les interventions auto-administrées pour la douleur chronique sera offert.

Problématique de la douleur chronique

La douleur chronique constitue un enjeu de santé publique majeur, affectant de millions de personnes à travers le monde. Contrairement à la douleur aiguë, qui sert de signal d'alarme face à un danger imminent, la douleur chronique perd sa fonction protectrice et persiste au-delà du processus normal de guérison, souvent pendant des mois,

voire des années. Cette condition entraine des répercussions importantes dans la vie des individus et s'accompagne fréquemment de comorbidités physiques et psychologiques telles que l'anxiété et la dépression. En raison de l'augmentation de sa prévalence et de la complexité de sa gestion, une compréhension plus approfondie et le développement de stratégies d'intervention efficaces pour la douleur chronique sont devenues des priorités essentielles dans le domaine de la recherche.

Définition de la douleur chronique

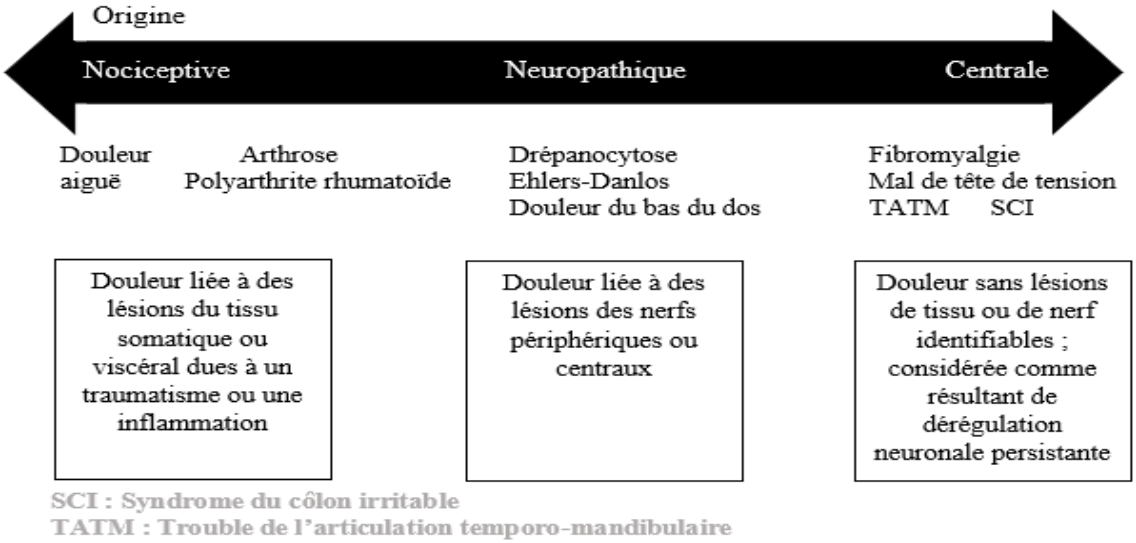
L'Association internationale pour l'étude de la douleur (*International Association for the Study of Pain*; IASP) définit la douleur comme « une expérience sensorielle et émotionnelle désagréable associée ou ressemblant à celle associée à une lésion tissulaire réelle ou potentielle » (Raja et al., 2020, p. 1976). La douleur est une expérience subjective influencée, à divers degrés, par des facteurs biologiques, psychologiques et sociaux. Pour être considérée chronique, la douleur doit être présente, de façon continue ou récurrente, sur une période de plus de trois mois (Nicholas et al., 2019).

La recherche actuelle identifie trois types de douleurs chroniques selon les mécanismes qui la causent : les douleurs nociceptives, les douleurs neuropathiques et les douleurs centralisées (ou nociplastiques). Les douleurs nociceptives résultent d'une activation excessive des récepteurs de la douleur en réponse à une lésion tissulaire due à une inflammation ou un dommage mécanique (p. ex., un entorse lombaire aiguë, une coupure, une brûlure, une lithiase rénale). Les douleurs neuropathiques, quant à elles, sont

causées par des lésions ou un dysfonctionnement du système nerveux (p. ex., neuropathie diabétique, sciatique chronique). Enfin, les douleurs centralisées se caractérisent par une altération du traitement de la douleur par le système nerveux central, ce qui entraine une amplification de la douleur ou une perception douloureuse anormale en réponse à des stimuli habituellement non douloureux (p. ex., fibromyalgie, syndrome de l'intestin irritable, céphalées de tension chronique). Les trois types de douleur peuvent être présents à la fois (Dionne & Veillette, 2021). Une perspective récente propose de classifier les divers syndromes de douleur chronique sur un continuum allant de la douleur purement nociceptive à une douleur purement centralisée (voir Figure 1). Ce continuum estime que les types de douleur ne sont pas mutuellement exclusifs.

Figure 1

Les types de douleur chronique



Source. Tirée de Arnold et al. (2016).

Dans la 11e révision de la Classification internationale des maladies (CIM-11), l'Organisation mondiale de la santé (OMS) a reconnu la douleur chronique comme un diagnostic à part entière en distinguant la douleur chronique primaire de la douleur chronique secondaire. La douleur chronique primaire réfère à la douleur qui est présente malgré la guérison complète, ou la douleur qui existe sans cause identifiable, alors que la douleur chronique secondaire est associée à une maladie sous-jacente (p. ex., douleur chronique liée au cancer).

Prévalence

La douleur chronique est un problème de santé publique important dans le monde entier touchant des millions de personnes et affectant négativement leur qualité de vie. À l'échelle mondiale, on estime qu'environ 20 % des adultes souffrent de douleur chronique, avec une prévalence qui varie selon les régions et populations (Due Bruun et al., 2023). La variabilité entre les pays pourrait être explicable, en partie, par des différences dans la façon de définir la douleur chronique (durée, sévérité, fréquence et type) et en raison de l'hétérogénéité des méthodes de collecte de données utilisées (Zimmer et al., 2022). Au Canada, la douleur chronique affecterait environ une personne sur quatre chez les personnes âgées de 15 ans et plus, ce qui représente près de 8 millions de personnes (Santé Canada, 2019). La prévalence serait plus élevée chez les femmes et elle augmenterait en fonction de l'âge (Santé Canada, 2019; Zimmer et al., 2022). Avec le vieillissement de la population canadienne, il est attendu que le nombre de Canadiens aux prises avec la douleur chronique ne fasse qu'augmenter (Santé Canada, 2021).

Conséquences

La douleur chronique engendre des conséquences considérables sur la société canadienne. Selon des analyses de Santé Canada, en 2019, le coût total de frais directs (p. ex., frais médicaux) et indirects (p. ex., pertes de revenus et pertes de productivité) de cette problématique de santé se situait entre 38,3 et 40,4 milliards de dollars. Avant tout, la douleur chronique peut engendrer une souffrance importante sur le plan individuel. La douleur chronique est associée à des changements notables sur les plans physique, émotionnel, social, familial, économique et professionnel (Dueñas et al., 2016). Dans une étude réalisée dans sept provinces canadiennes, la douleur chronique interférait avec le sommeil chez près de 60 % des participants et avec les activités quotidiennes (p. ex., capacité à marcher, activités récréatives et sociales, travail, etc.) chez près de deux tiers de l'échantillon (Choinière et al., 2010). La douleur chronique est également associée au développement de troubles psychologiques tels que l'anxiété et la dépression (Asmundson & Katz, 2009; Currie & Wang, 2004; Gerrits et al., 2014). Par exemple, dans l'étude de Choinière et al. (2010), la majorité des participants rapportaient des scores de dépression d'intensité modérée à sévère et plusieurs rapportaient également des scores élevés d'anxiété et de colère. De plus, la douleur chronique est considérée un facteur de risque au suicide (Chincholkar & Blackshaw, 2023; Racine, 2018). Selon Tang et Crane (2006), une personne atteinte de douleur chronique serait deux fois plus à risque de se suicider comparativement à une personne n'ayant pas de douleur.

En somme, les conséquences négatives de la douleur chronique vont bien au-delà de l'intensité de la douleur elle-même. La douleur chronique interfère avec la capacité d'une personne à réaliser des activités quotidiennes et elle est associée à des taux élevés d'anxiété, de dépression et de suicide. Elle engendre également des coûts importants pour le système de soins de santé et pour la société. Considérant que cette condition de santé affecte un quart de la population canadienne et devant l'ampleur des conséquences qui en découlent, il est primordial d'améliorer la qualité et l'accessibilité des traitements pour cette problématique de santé. Parmi les traitements disponibles, les interventions psychologiques occupent un rôle central (Jensen & Turk, 2014), car elles peuvent aider les personnes à modifier les pensées, émotions et comportements associés à la douleur, et ainsi permettre aux personnes de mieux s'adapter à cette condition.

Approches psychologiques existantes

Parmi les approches psychologiques pour la douleur chronique, la thérapie cognitivo-comportementale (TCC) a longtemps été une approche de choix (Ehde et al., 2014). La TCC a pour objectif d'intervenir sur les comportements et les cognitions associées à la douleur afin de réduire les symptômes et améliorer le fonctionnement de la personne. Une revue récente de Cochrane (Williams et al., 2020) considère qu'il y a maintenant un nombre important de recherches appuyant l'efficacité des psychothérapies basées sur la TCC en face-à-face pour appuyer des effets bénéfiques dans la réduction de la douleur, de l'incapacité reliée à la douleur, et de la détresse psychologique auprès de personnes souffrant de douleur chronique. Toutefois, les tailles d'effet sont généralement faibles.

Les thérapies cognitivo-comportementales ont beaucoup évolué au cours des dernières années. Récemment, des approches dites de « troisième vague », s'appuyant sur des processus d'acceptation et de pleine conscience, sont devenues de plus en plus populaires. Plutôt que de chercher à réduire la douleur, ces approches visent à favoriser l'acceptation de la douleur et à améliorer la qualité de vie des individus. Une méta-analyse (Veehof et al., 2016) incluant 25 essais randomisés contrôlés (N = 1285 patients) a comparé les thérapies basées sur l'acceptation et la pleine conscience à une liste d'attente, à un traitement (médical) habituel, et à l'éducation psychologique ou du soutien (groupe contrôle). Les résultats ont démontré des effets bénéfiques dans la réduction de l'intensité de la douleur, les symptômes d'anxiété et de dépression, l'incapacité reliée à la douleur, et dans l'amélioration de la qualité de vie. Les tailles d'effet varient de faibles (SMD = 0,24, IC 95 % [0,06, 0,42] pour l'intensité de la douleur; SMD = 0,40, IC 95 % [0,01, 0,79] pour l'incapacité) à modérées (SMD = 0,51, IC 95 % [0,10, 0,92] pour l'anxiété; SMD = 0,62, IC 95 % [0,21, 1,03] pour l'interférence) au post-test et de faibles (SMD = 0,41, IC 95 % [0,14, 0,68] pour l'intensité de la douleur; SMD = 0,39, IC 95 % [0,11, 0,67] pour l'incapacité) à élevées (SMD = 1,05, IC 95 % [0,55, 1,56] pour l'interférence) au suivi. Parmi les approches thérapeutiques incluses dans cette méta-analyse, la thérapie d'acceptation et d'engagement (Acceptance and Commitment Therapy ou « ACT »; Hayes et al., 2012) s'est démarquée. Des analyses de sous-groupes ont montré que les interventions ACT avaient un effet moyen statistiquement plus élevé que le *Mindfulness Based Stress Reduction* (MBSR) et le *Mindfulness Based Cognitive Therapy* (MBCT) pour la dépression et l'anxiété (Veehof et al., 2016).

Thérapie d'acceptation et d'engagement et douleur chronique

L'ACT est considérée comme une approche transdiagnostique qui peut être applicable auprès de différentes problématiques ou diagnostics psychologiques car elle cible des processus communs à la psychopathologie. Elle se distingue de la TCC traditionnelle dans le traitement de la douleur chronique car plutôt que de viser le contrôle de la douleur, l'ACT vise l'amélioration de la flexibilité psychologique en favorisant l'acceptation et l'ouverture face aux expériences telles qu'elles sont dans le moment, ainsi qu'un plus grand engagement envers des actions valorisées par l'individu (p. ex., famille, amis, etc.; McCracken & Vowles, 2014). Selon la théorie qui sous-tend l'ACT, la douleur (autant physique qu'émotionnelle) est une partie inhérente de l'expérience humaine; elle est donc inévitable. Paradoxalement, les efforts excessifs pour s'en débarrasser deviennent une source de souffrance (Hayes et al., 2012). En d'autres mots, il est naturel pour l'être humain de vouloir éviter des expériences déplaisantes telles que la douleur. Toutefois, lorsque l'être humain fait des efforts démesurés pour éviter la douleur ou la contrôler et que ceux-ci sont inefficaces, il peut devenir pris dans une « lutte » contre la douleur (Hayes et al., 1996). Les efforts pour contrôler ou se débarrasser de l'expérience douloureuse (p. ex., la distraction excessive, l'évitement de diverses situations) peuvent contribuer à amplifier l'expérience désagréable et éloigner la personne des activités qui sont importantes pour elle (Hayes et al., 1996, 2006, 2012). Ainsi, selon cette perspective, ce ne sont pas les expériences en soi (comme la douleur) qui sont problématiques, mais plutôt les stratégies d'évitement qui éloignent la personne de ses valeurs.

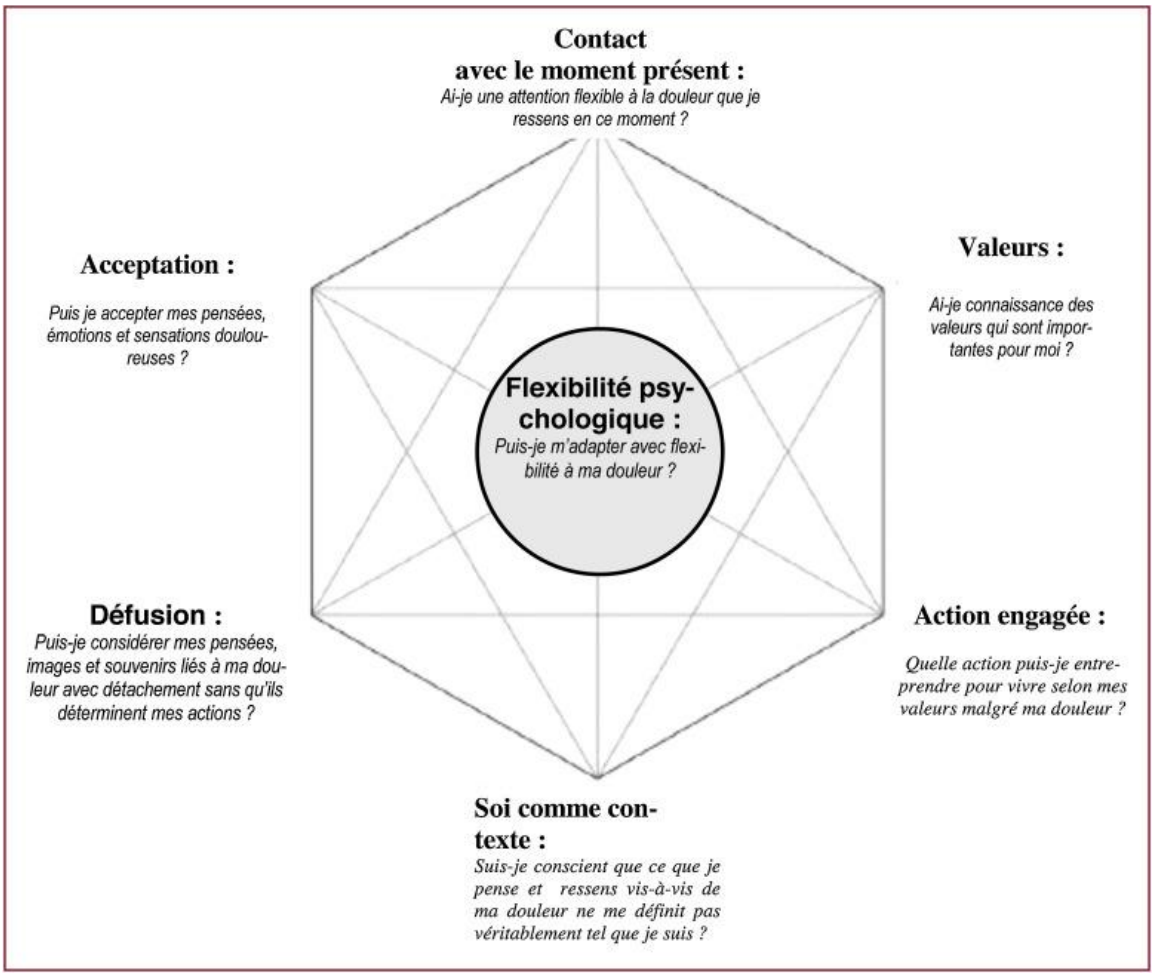
L'ACT s'appuie également sur la Théorie des cadres relationnels (*Relational frame theory*; Hayes et al., 2001), une théorie comportementale du langage et de la cognition. Selon cette théorie, la capacité à relier des stimuli en fonction de leurs propriétés physiques et arbitraires est la base de la cognition humaine. Des règles mentales découleraient des relations entre les stimuli (p. ex., « la douleur est mauvaise et donc elle doit être évitée ») et contribueraient à une plus grande rigidité (ou inflexibilité) du comportement, et donc à une plus grande souffrance psychologique. L'ACT vise alors à changer la *relation* du patient vis-à-vis ses symptômes (plutôt que de chercher à modifier ou diminuer les symptômes eux-mêmes) et à augmenter sa flexibilité psychologique.

Modèle de flexibilité psychologique

Selon le modèle qui sous-tend l'ACT présenté à la Figure 2, la flexibilité psychologique comprend six processus centraux : la défusion cognitive, l'acceptation, le contact avec le moment présent, le soi comme contexte, les valeurs et l'action engagée (Hayes et al., 2012). Ces processus sont interreliés et peuvent être regroupés en trois axes principaux : « ouvert » (processus d'acceptation et de défusion), « centré » (contact avec le moment présent, soi comme contexte) et « engagé » (valeurs, actions engagées). La flexibilité psychologique (à l'inverse de l'inflexibilité) réfère à la capacité d'une personne à être en contact avec son expérience dans le moment présent, de façon ouverte, tout en agissant selon ses valeurs personnelles (Hayes et al., 2012).

Figure 2

Le modèle de flexibilité psychologique appliqué à l'expérience de la douleur



Source. Tirée de Masselin-Dubois (2016).

Inflexibilité et psychopathologie

À l'inverse, l'inflexibilité psychologique est le processus par lequel les expériences déplaisantes (pensées, sensations, émotions) mènent à des conséquences négatives telle que l'incapacité reliée à la douleur (Hayes et al., 2006). L'inflexibilité psychologique (ou la rigidité psychologique) comprend six processus pathologiques centraux : l'évitement

expérientiel, la fusion cognitive, le concept prédominant du passé et du futur (connaissance de soi restreinte), l'attachement au soi comme concept, l'absence de valeurs et l'action inutile (Harris, 2012; Hayes et al., 2006). L'évitement expérientiel et la fusion cognitive seraient deux processus psychologiques centraux qui contribueraient au développement et au maintien des troubles psychologiques (Hayes et al., 2012). L'évitement expérientiel réfère à la tendance à éviter la prise de contact avec des évènements internes douloureux ou désagréables (pensées, émotions, sensations, images, souvenirs) de sorte que le répertoire comportemental de l'individu se rétrécit (Hayes et al., 2012). La fusion cognitive peut être définie comme « prendre ses pensées pour des faits », de sorte que les pensées de l'individu dominent son comportement (p. ex., je ne peux me lever ce matin car j'ai trop mal). L'évitement et la fusion vont généralement de pair, la fusion conduit à l'évitement et vice versa (Harris, 2012). Le modèle de flexibilité/ inflexibilité psychologique est non seulement un modèle théorique pour l'ACT, mais également un modèle thérapeutique, c'est-à-dire que les cliniciens peuvent évaluer et cibler chacun des processus dans leurs interventions.

Efficacité de la thérapie d'acceptation et d'engagement

Depuis 2010, selon la Division 12 de l'American Psychological Association (APA, 2016), l'ACT est considérée une approche thérapeutique « hautement établie » (*well-established*) pour la douleur chronique (diagnostics variés). Au cours de la dernière décennie, le nombre d'essais contrôlés randomisés (ECR) évaluant les résultats thérapeutiques de l'ACT pour la douleur chronique a beaucoup augmenté et il existe

plusieurs revues systématiques et méta-analyses sur le sujet. Récemment, une méta-analyse a été publiée présentant un survol des revues systématiques avec méta-analyses de l'ACT pour la douleur chronique (Martinez-Calderon et al., 2024). Les chercheurs ont révisé les résultats de neuf revues systématiques comprenant 84 méta-analyses avec l'objectif de résumer les effets potentiels de l'ACT pour la douleur chronique. Dans l'ensemble, les résultats de cette étude démontrent que l'ACT peut mener à des résultats thérapeutiques à travers le temps dans la réduction de l'incapacité reliée à la douleur. Plus spécifiquement, les méta-analyses ont principalement démontré qu'immédiatement après l'intervention (au post-test), l'ACT parvenait à réduire les symptômes anxiodépressifs, l'inflexibilité psychologique et la dramatisation face à la douleur, en plus d'améliorer l'acceptation de la douleur, la pleine conscience et la flexibilité psychologique. Les résultats suggèrent aussi qu'aux suivis à plus long-terme (entre trois, six et douze mois), l'ACT réduirait les symptômes dépressifs, l'inflexibilité psychologique et la dramatisation face à la douleur. De plus, elle permettrait d'améliorer le fonctionnement relié à la douleur, la pleine conscience, l'acceptation de la douleur, la flexibilité psychologique et la qualité de vie. Toutefois, il est important de noter que différentes modalités de traitement (p. ex., thérapie en face-à-face ou en-ligne, en individuel ou en groupe et interventions ACT auto-administrées) étaient incluses dans ces méta-analyses, faisant en sorte que nous ne connaissons pas les tailles d'effet respectives de chaque modalité.

Difficultés d'accès

Malgré le nombre croissant d'études qui appuient l'efficacité de l'ACT pour la douleur chronique, les personnes souffrant de douleur chronique parviennent difficilement à obtenir des soins pour traiter leur douleur. L'allègement de la douleur est pourtant un droit humain fondamental (Cousins & Lynch, 2011). Il existe effectivement plusieurs obstacles, dont un nombre insuffisant de spécialistes qualifiés, des longues listes d'attente, des coûts élevés, la distance des centres urbains où sont habituellement offerts ces services, les difficultés liées à la mobilité ou le transport, et la réticence des gens à suivre un traitement en face à face due aux préjugés ou à la stigmatisation (Boulanger et al., 2016; Campbell et al., 2020; Choinière et al., 2020; Hogg et al., 2012). De plus, la pandémie n'a fait qu'exacerber les difficultés d'accès aux traitements (Lacasse et al., 2021; Lynch et al., 2020). Par exemple, selon une étude canadienne (Lacasse et al., 2021), un manque d'accès aux services/ installations était la raison la plus commune pour des changements dans les traitements physiques/ psychologiques de la douleur durant la pandémie. Il apparait alors crucial de faire plus d'efforts pour améliorer l'accessibilité aux traitements appuyés par des données probantes. En particulier, des programmes de traitement auto-administrés (*self-help*) sont prometteurs, car ils constituent une option rentable qui requièrent habituellement un soutien minimal par un thérapeute.

Interventions auto-administrées

Les traitements auto-administrés sont des interventions psychosociales standardisées administrées par l'entremise d'un livre (bibliothérapie), d'une plateforme Web ou

d'applications mobiles (Cavanagh et al., 2014; Gould & Clum, 1993; Mains & Scogin, 2003; Newman et al., 2003). Ces interventions visent à « guider et encourager le patient à faire des changements… plutôt que de simplement fournir des informations » (Anderson et al., 2005; cité dans French et al., 2017, p. 387). La littérature distingue quatre niveaux d'interventions auto-administrées : (1) *auto-administré*, c'est-à-dire un traitement où il n'y a aucun contact avec un thérapeute (sauf pour l'évaluation, le cas échéant); (2) *principalement auto-administré*, où il y a l'ajout d'un contact thérapeutique périodique (p. ex., appels téléphoniques, rencontres ou courriels occasionnels) permettant de présenter les composantes du programme, clarifier certaines informations ou enseigner la façon d'utiliser certains outils thérapeutiques; (3) *contact minimal*, c'est-à-dire une participation active du thérapeute mais à un moindre degré qu'en thérapie traditionnelle et pouvant aider avec certains aspects de l'intervention (p. ex., créer une hiérarchie d'exposition); et (4) *principalement administré par un thérapeute*, où le client voit le thérapeute régulièrement, mais une intervention auto-administrée est donnée comme adjuvant (Newman et al., 2003, p. 253; cité dans French et al., 2017). Les recherches antérieures suggèrent qu'une plus grande implication du thérapeute améliore les gains thérapeutiques (pour des revues systématiques et méta-analyses, voir French et al., 2017; Gandy et al., 2022; Thompson et al., 2021).

La recherche suggère généralement que le format n'aurait pas d'impact sur les résultats thérapeutiques (French et al., 2017; Heapy et al., 2015), mais certains résultats d'études antérieures demeurent contradictoires. Par exemple, une revue systématique

(French et al., 2017) indique que les interventions par ordinateur/ audio auraient des effets supérieurs à la bibliothérapie. Cependant, une des deux études citées date de 1988 et réfère à une cassette audio, un format maintenant désuet. Plus de recherches sont nécessaires dans ce domaine afin de mieux comprendre l'efficacité des divers formats d'interventions auto-administrées. Des comparaisons directes entre formats sont recommandées (Heapy et al., 2015).

Interventions auto-administrées et ACT

Actuellement, très peu d'ECR ont évalué l'efficacité de la bibliothérapie ACT pour la douleur chronique. Dans l'ensemble, les résultats suggèrent qu'en comparaison à une liste d'attente, les individus participant à de la bibliothérapie ACT démontrent des améliorations dans l'incapacité/ le fonctionnement relié à la douleur, l'intensité de la douleur, les symptômes d'anxiété et de dépression, l'inflexibilité psychologique, la qualité de vie et l'acceptation de la douleur avec des tailles d'effet variant de moyennes à élevées (Johnston et al., 2010; Thorsell et al., 2011; Veillette et al., 2019). Certains de ces gains thérapeutiques étaient maintenus lors des suivis de 3, 6, et 12 mois. Toutefois, une étude a utilisé un très petit échantillon (N = 14; Johnston et al., 2010), et une autre a inclus deux séances en face-à-face et plusieurs contacts téléphoniques avec un thérapeute, ce qui rend plus difficile l'évaluation des effets spécifiques du livre (Thorsell et al., 2011). Deux de ces études ont utilisé des listes d'attente au lieu de groupes contrôles actifs, ce qui est une limite importante à considérer. Et les deux seules études examinant les effets à plus long-

terme avaient des taux d'attrition élevés (≥ 37 %; Thorsell et al., 2011; Veillette et al., 2019), limitant ainsi la généralisation des résultats.

D'ailleurs, notre laboratoire de recherche a effectué une étude pilote (Veillette et al., 2019) évaluant l'efficacité d'une intervention de bibliothérapie basée sur l'ACT pour la douleur chronique en comparaison à une condition liste d'attente. L'échantillon comprenait 140 adultes de la communauté avec des diagnostics de douleur chronique variés. L'intervention s'est déroulée sur une période de 8 semaines et il y avait trois temps de mesure : le pré-test-, post-test, et un suivi de trois mois. Les résultats ont montré des différences significatives entre le pré-test et le post-test sur l'incapacité reliée à la douleur, la dépression, l'acceptation et l'inflexibilité psychologique en faveur de la condition ACT. Les résultats étaient maintenus au suivi de trois mois. Ces résultats sont encourageants, car ils suggèrent qu'une intervention auto-administrée par l'entremise d'un livre peut améliorer le fonctionnement physique et émotionnel d'adultes aux prises avec la douleur chronique. Toutefois, une limite importante de cette étude est l'utilisation d'une condition liste d'attente au lieu d'un groupe contrôle actif, ce qui limite la généralisation de l'effet du temps et ne permet pas le contrôle de variables non-spécifiques ou de facteurs communs (p. ex., le fait de recevoir un livre pourrait susciter de l'espoir chez les participants du groupe ACT).

Il existe un peu plus de littérature sur les interventions ACT en ligne (auto-administrées par le Web) pour la douleur chronique, incluant quelques études

pilotes/ essais de faisabilité (Fledderus et al., 2015; Ljótsson et al., 2014; Rickardsson et al., 2020; Scott et al., 2018, 2021; Sullivan et al., 2018). Une étude récente (Rickardsson et al., 2021) a comparé une intervention ACT en ligne à une condition liste d'attente et les résultats ont démontré des tailles d'effet élevées pour l'incapacité et l'intensité de la douleur, des tailles d'effet moyennes pour les symptômes d'anxiété et de dépression et des tailles d'effet faibles pour la qualité de vie et l'insomnie. De plus, les résultats étaient maintenus au suivi d'un an, ce qui semble prometteur. Toutefois, il est important de noter que dans cette étude (N = 113), les participants recevaient plusieurs messages par texto et au moins un appel provenant d'un thérapeute par semaine, ce qui peut rendre plus difficile d'évaluer la composante auto-administrée du programme. Aussi, le groupe contrôle était une liste d'attente et non un traitement actif, ce qui est également considéré une limite importante à cette étude.

Une méta-analyse récente (Trindade et al., 2021) a examiné l'efficacité des interventions en ligne ACT pour la douleur chronique en comparaison à des groupes contrôles. Cette méta-analyse comprend un total de cinq études (Buhrman et al., 2013; Lin et al., 2017; Scott et al., 2018; Simister et al., 2018; Trompetter et al., 2015) qui comparent une intervention ACT en ligne à une autre condition (N = 764). Plus précisément, deux études ont comparé l'ACT au traitement habituel (Scott et al., 2018; Simister et al., 2018), une étude a comparé l'ACT à un groupe contrôle actif qui participait à un forum de discussion en ligne modéré (Buhrman et al., 2013), une étude comparait une intervention ACT guidée à une intervention ACT non-guidée et une liste d'attente (Lin et al., 2017), et

une étude comparait l'ACT à une condition d'écriture expressive et une liste d'attente (Trompetter et al., 2015). Les résultats de cette méta-analyse démontrent des tailles d'effet moyennes pour l'incapacité reliée à la douleur et l'acceptation de la douleur en faveur de l'ACT au post-test et au suivi de six mois. Les résultats démontrent également une taille d'effet faible en faveur de l'ACT pour la dépression au post-test et à la relance de six mois, ainsi qu'une taille d'effet faible pour l'anxiété en faveur de l'ACT au suivi de six mois. Toutefois, l'effet au post-test n'était pas significatif. Ces résultats sont généralement similaires aux résultats de la méta-analyse de Veehof et al. (2016) sur l'efficacité de l'ACT en face-à-face, mais certaines tailles d'effet de Veehof et al. et de Hughes et al. (2017) étaient plus élevées. Une des critiques les plus importantes des études effectuées jusqu'à présent sur les interventions auto-administrées est le manque de groupe de comparaison actif (c'est-à-dire un autre traitement appuyé par les données probantes).

Étude des processus et trajectoires de changement

Au cours des dernières années, il a été recommandé que la recherche aille au-delà de l'étude de l'efficacité des interventions (Hayes et al., 2021, 2023; Jando & Dionne, 2024) et qu'elle examine les mécanismes sous-jacents ou processus de changements thérapeutiques. Les mécanismes sous-jacents aux interventions psychologiques sont considérés comme étant spécifiques ou non-spécifiques. Les mécanismes spécifiques réfèrent aux processus thérapeutiques ciblés par l'intervention. Par exemple, dans l'ACT, les processus spécifiques réfèrent aux six composantes du modèle de flexibilité psychologique : la défusion cognitive, l'acceptation, le contact avec le moment présent, le

soi comme contexte, les valeurs et l'action engagée (Hayes et al., 2012). Les mécanismes non-spécifiques, quant à eux, réfèrent plutôt à des facteurs contextuels (p. ex., l'alliance thérapeutique ou la satisfaction du patient), des variations naturelles dans la condition traitée, ainsi que des mécanismes communs à travers divers types d'intervention. Ainsi, de plus en plus d'études s'intéressent aux médiateurs et modérateurs de traitement (voir Murillo et al., 2022 pour une revue systématique et méta-analyse des médiateurs et modérateurs des interventions psychologiques ACT et TCC pour des douleurs chroniques musculosquelettiques). Toutefois, des lacunes importantes subsistent dans la littérature. Les études de médiation sur l'ACT ont entre autres été critiquées pour avoir mis trop d'emphase sur l'acceptation comme processus de changement alors que les cinq autres processus de flexibilité psychologique ont souvent été négligés, menant ainsi à un manque d'intégration du modèle théorique. Dans l'ensemble, plus de recherches sont nécessaires afin de mieux comprendre les mécanismes spécifiques et non-spécifiques des interventions psychologiques (Murillo et al., 2022).

Afin de mieux comprendre comment les individus changent à travers le temps, il peut aussi être pertinent d'analyser des données longitudinales à différents moments d'une intervention pour déterminer s'il existe différentes trajectoires de changement chez des sous-groupes de participants. Les analyses de modèles de croissance à effets mixtes (*growth mixture modeling*; Frankfurt et al., 2016) peuvent être utiles à cet effet, car elles permettent d'identifier des classes latentes (des sous-groupes) de participants avec des trajectoires de changements distinctes. Contrairement aux analyses de médiation qui

tentent de comprendre les mécanismes par lesquels une variable indépendante influence une variable dépendante et aux analyses de modération qui ont pour but d'évaluer si la force ou la direction de la relation entre une variable indépendante et une variable dépendante change en fonction d'une autre variable (modératrice), les modèles de croissance à effets mixtes s'intéressent aux changements à travers le temps et nous éclairent donc sur la variabilité individuelle lors d'un traitement. Ces analyses permettent de modéliser simultanément les effets fixes (c'est-à-dire les effets systématiques attribuables aux variables explicatives et aux tendances moyennes) et les effets aléatoires (qui capturent la variabilité interindividuelle) afin d'examiner la stabilité et le changement des résultats thérapeutiques à travers le temps. De plus, il est possible à travers ces modèles d'inclure un ou plusieurs prédicteurs de croissance afin d'identifier les variables associées à l'intercept et à la pente des trajectoires de changement. En d'autres mots, ceci permet d'évaluer l'hypothèse selon laquelle certaines caractéristiques de l'individu (p. ex., le genre ou le groupe d'intervention) peuvent prédire des points de départ plus élevés/ bas ou des taux de changement plus/ moins rapides au fil du temps (Curran et al., 2010). En somme, l'identification de trajectoires de changements peut s'avérer utile pour mieux comprendre comment les individus changent à travers le temps, pour identifier quels individus répondent bien (ou moins bien) aux interventions, et pour adapter et optimiser les interventions.

Malgré la pertinence de ce type d'analyses, à notre connaissance, aucune étude à ce jour s'est intéressée aux trajectoires de changement au cours d'interventions auto-

administrées ACT. Seulement deux études se sont intéressées aux trajectoires de changement au cours de traitements interdisciplinaires ACT pour la douleur chronique d'une durée de quatre semaines. La première étude (Vowles et al., 2017) s'est intéressée aux changements dans l'intensité de la douleur et la détresse associée à la douleur. Les résultats ont montré une seule classe de trajectoire latente avec une pente quadratique décroissante pour l'intensité de la douleur ainsi que deux trajectoires distinctes pour la détresse associée à la douleur : une trajectoire avec une diminution linéaire au cours des quatre semaines du programme (70,3 % des participants étaient classés dans cette classe) et l'autre trajectoire était caractérisée par une augmentation en début du programme suivie d'une diminution plus rapide se rapprochant aux scores initiaux au cours des dernières semaines du programme (29,7 % des participants appartenaient à cette classe). La deuxième étude a examiné les trajectoires de changement dans les activités reliées aux valeurs (une des six composantes du modèle théorique de l'ACT; Vowles et al., 2019). Les chercheurs ont regardé certains résultats thérapeutiques (p. ex., incapacité reliée à la douleur, dépression, anxiété) à la fin du programme et au suivi de trois mois. Leurs résultats ont démontré qu'une seule classe de trajectoire linéaire caractérisait le mieux les changements de valeurs durant le traitement, indiquant que les scores sur un outil mesurant les actions valorisées s'amélioraient avec le temps au cours des quatre semaines du traitement de façon similaire d'un individu à l'autre. Dans la section discussion de cet article, les auteurs mentionnent que dans une étude précédente, ils ont tenté d'identifier des caractéristiques des participants au pré-test afin de distinguer les répondants des non-répondants. Les variables incluaient : le genre, l'âge, la durée de la douleur, l'acceptation

de la douleur, l'engagement dans des actions valorisées, l'intensité de la douleur, la dépression, l'anxiété, l'incapacité physique et psychosociale, et les visites médicales reliées à la douleur. Aucune de ces variables n'était associée à la réponse au traitement. De plus, les auteurs mentionnent que ces résultats corroborent les résultats d'une revue de la littérature sur les prédicteurs de réponse au traitement (McCracken & Turk, 2002) qui aurait également noté l'absence de prédicteurs fiables.

Une étude de Trompetter et al. (2016) s'est intéressée aux modérateurs et prédicteurs de changement dans une intervention ACT auto-administrée par le Web de 9 à 12 semaines en comparaison à des groupes contrôles d'écriture expressive et de liste d'attente afin d'identifier pour quels individus cette modalité de traitement serait (in)efficace. Il est à noter que les chercheurs ne se sont pas intéressés aux trajectoires de changement à l'aide de modèles de croissance à effets mixtes mais qu'ils se sont plutôt seulement intéressés aux modérateurs et prédicteurs de changements à l'aide d'analyses exploratoires de régression linéaires. Les résultats de leur étude ont montré que la seule variable modératrice significative était le bien-être psychologique au pré-test. De plus, l'incapacité reliée à la douleur, l'anxiété et la dépression, et le bien-être émotionnel étaient des prédicteurs significatifs. Les variables démographiques (âge, genre, éducation, statut d'emploi, durée des plaintes de la douleur) et l'intensité de la douleur n'étaient pas significatives comme modérateurs ou prédicteurs.

Puisque ce sont les seules études qui se rapprochent des interventions auto-administrées ACT, nous avons élargi notre recherche pour examiner la littérature sur les interventions auto-administrées basées sur la TCC dans le traitement de d'autres problématiques. Il y a une étude (Batterham et al., 2017) qui a examiné des trajectoires de changement pour un ECR d'une intervention TCC auto-administrée par le Web pour l'insomnie visant à prévenir la dépression. Deux trajectoires ont été identifiées dans cette étude : des patients notant une amélioration (95 %) et des patients rapportant une stabilité/ détérioration des symptômes (5 %). Les prédicteurs identifiés étaient des degrés plus sévères de dépression au pré-test, un âge plus jeune, et un degré de confort limité avec l'Internet.

Enfin, une revue systématique a tenté d'identifier les modérateurs et prédicteurs de résultats thérapeutiques dans les études de TCC contextuelles (incluant mais ne se limitant pas à ACT et non limités aux interventions auto-administrées) pour la douleur chronique (Gilpin et al., 2017). Cette revue systématique comprenait 20 articles scientifiques mais seulement 7 de ceux-ci avaient comme objectif primaire d'examiner les prédicteurs/ modérateurs de traitement plutôt que de faire des analyses exploratoires ou post-hoc. Les variables ont été catégorisées ainsi : la sévérité de la douleur, la qualité de vie, le fonctionnement social, le fonctionnement émotionnel, le fonctionnement physique, l'incapacité psychosociale, l'incapacité globale reliée à la douleur et « autre ». Bien que certains résultats suggèrent qu'un degré plus élevé de détresse psychologique au départ ou un historique de dépression puissent mener à de meilleurs gains thérapeutiques, ces

résultats étaient mixtes dans la littérature et pourraient être attribuables à des effets de plafond. Les résultats de cette revue systématique démontrent aussi que les prédicteurs démographiques sont incohérents à travers les études mais plus souvent non-significatifs. En ce qui a trait aux variables cliniques au pré-test, les résultats sont à nouveau incohérents et inconcluants. De plus, les chercheurs mentionnent qu'il est surprenant qu'aucune étude n'ait examiné les processus de flexibilité psychologique comme prédicteurs de réponse au traitement. L'inclusion de ces processus pourrait être utile pour mieux adapter les interventions. Bref, nos connaissances quant aux patrons de changements au cours des interventions auto-administrées et aux caractéristiques/ prédicteurs de personnes qui répondraient bien (ou pas) à ce type d'intervention sont très limitées.

Limites des études sur les interventions auto-administrées

Jusqu'à présent, les résultats d'études sur les interventions auto-administrées ACT semblent prometteurs, mais des limites importantes persistent. Premièrement, même si de plus en plus d'études appuient l'efficacité des interventions auto-administrées ACT pour la douleur chronique, d'autres études sont nécessaires afin d'appuyer leur efficacité et notamment, avec des devis plus robustes. Certaines études ont été réalisées avec des petits échantillons et plusieurs études n'ont pas inclus de suivis à plus long terme ce qui ne permet pas de savoir si les effets se maintiennent à plus long terme. De plus, certaines études réalisées avaient des taux d'attritions élevés, ce qui limite la généralisation des résultats. La qualité des études pourrait être améliorée (Trindade et al., 2021), entres autres, avec l'équivalence des groupes. Plusieurs études effectuées jusqu'à présent ont

comparé les interventions auto-administrées ACT à une liste d'attente ou le traitement habituel. Il est fortement recommandé que les études futures comparent à un autre traitement empiriquement validé afin de mieux établir la validité du traitement.

Deuxièmement, il n'est pas clair si le format des interventions auto-administrées a un effet sur l'efficacité. Il serait pertinent pour les recherches futures de comparer différents formats d'interventions auto-administrées (p. ex., bibliothérapie vs. Web) ou comparer un traitement face à face ACT avec un traitement auto-administré ACT. Plus d'études sont nécessaires afin de mieux comprendre quelles conditions de traitement, dont les mécanismes/ processus de changement, et quels formats sont associés à quels résultats thérapeutiques. Cette information permettrait d'optimiser les interventions futures.

Troisièmement, bien que les interventions auto-administrées ACT pour la douleur chronique aient démontré certains résultats thérapeutiques avec des tailles d'effet variables, nous en savons très peu sur les patrons de changement à travers le temps. La plupart des études mesurent l'efficacité en comparant les scores moyens sur des variables primaires et secondaires avant et après une intervention, ne fournissant pas ainsi un portrait clair de la variabilité individuelle tout au long de l'intervention. Bien que généralement les participants aient tendance à s'améliorer à la suite d'une intervention psychologique, il est possible que certaines personnes en bénéficient plus que d'autres et que certains individus rapportent des effets négatifs (p. ex., augmentation de la douleur ou de la détresse psychologique). Il est aussi probable que certaines personnes en bénéficient

plus tôt, alors que d'autres pourraient nécessiter plus de temps avant de ressentir les effets thérapeutiques d'une intervention. Puisque les gens aux prises avec la douleur chronique sont un groupe hétérogène, il est nécessaire d'examiner qui peut bénéficier (ou pas) de ces interventions et qui aurait besoin d'un plus grand soutien thérapeutique. Ces informations sont importantes à connaitre si les interventions auto-administrées continuent à être utilisées et recommandées.

Objectifs de la thèse

L'objectif général de cette thèse est d'évaluer l'efficacité des interventions auto-administrées ACT pour la douleur chronique et de mieux comprendre les trajectoires de changement dans l'incapacité reliée à la douleur chez les individus participant à ces interventions. L'étude a été effectuée auprès de 297 adultes vivant avec de la douleur chronique (diagnostics variés) dans la communauté.

Cette thèse doctorale sera composée de deux articles. Le premier article a été publié dans la revue *Journal of Contextual Behavioral Science* en mai 2024 et il vise à évaluer l'efficacité d'un traitement ACT auto-administré pour la douleur chronique en comparant deux différents formats (la bibliothérapie et une plateforme Web) à un groupe contrôle actif recevant de l'éducation sur la douleur. Ce type de devis est utile pour établir la validité du traitement. Le deuxième article a été soumis au *Journal of Contextual Behavioral Science* et il examine les différentes trajectoires de changements durant ces interventions et tente d'identifier des caractéristiques et prédicteurs des individus

répondant plus/ moins bien à ces interventions. Cette information est importante à connaitre si les interventions auto-administrées continuent à être utilisées et recommandées. Les articles seront présentés aux chapitres suivants en respectant le format/ les normes de publication des revues scientifiques auxquelles ils ont été soumis/ publiés. Une conclusion générale résumera les résultats et fera état des implications de ceux-ci et des perspectives d'avenir.

Cette étude constitue une contribution importante à la littérature sur les interventions auto-administrées ACT pour la douleur chronique. Premièrement, peu d'études effectuées à présent ont utilisé un groupe contrôle actif et aucune étude à notre connaissance n'a directement comparé différents formats d'intervention ACT (bibliothérapie et Web) pour la douleur chronique. Deuxièmement, seulement quelques études ont inclus des suivis à plus long terme (p. ex., six mois) pour vérifier si les résultats se maintenaient à travers le temps. Troisièmement, quoique les résultats de ces interventions semblent généralement prometteurs, nous en savons aussi très peu sur les trajectoires de changement des individus participant à ces interventions. Ce projet de recherche tentera de combler ces manques dans la littérature.

Chapitre 1

A randomized controlled trial comparing two guided self-help Acceptance and Commitment Therapy formats to education on pain

A randomized controlled trial comparing two guided self-help Acceptance and Commitment Therapy formats to education on pain

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Abstract

Acceptance and Commitment Therapy (ACT) is an evidence-based treatment for chronic pain, but accessibility remains a major challenge. Self-help interventions are promising as they offer a cost-effective solution and can be widely accessible, but no study has yet directly compared different formats of ACT self-help for chronic pain. Furthermore, most studies conducted so far have not compared to an active control condition. This study aimed to evaluate the effectiveness of guided self-help interventions (Internet-delivered, bibliotherapy) based on ACT in comparison to an education intervention among adults from the community living with chronic pain. Participants (N = 297) were randomly assigned to an Internet-delivered ACT condition, an ACT-based bibliotherapy condition, or an active control condition receiving education on pain through online pamphlets. Participants completed questionnaires at baseline, after the 9-week intervention, and at 3- and 6-month follow-ups. The primary outcome was pain disability at post-intervention and secondary outcomes were depression, anxiety, and quality of life. Results of mixed linear models showed statistically significant main effects of time for pain disability ($F = 15.15$, $p = .000$), depression ($F = 6.82$, $p = .000$), anxiety ($F = 4.88$, $p = .003$) and quality of life ($F = 6.85$, $p = .000$) for all three interventions. Findings suggest all three self-help formats can lead to reductions in pain disability, depression, anxiety, and improvements in quality of life. These findings have important implications for accessibility of care. Limitations and future directions will be discussed.

Keywords: Self-help; Internet-delivered Interventions; Bibliotherapy; Acceptance and Commitment Therapy; Chronic Pain.

Acceptance and Commitment Therapy (ACT; Hayes et al., 2012) has shown empirical evidence of efficacy for chronic pain (CP; Hann & McCracken, 2014; Hughes et al., 2017; Simpson et al., 2017) with strong research support (American Psychological Association, 2016). Based on the psychological flexibility model, this process-based approach (McCracken & Vowles, 2014) offers a unified model to the treatment of chronic pain (McCracken & Morley, 2014). However, major barriers often prevent access to treatment (e.g., insufficient number of qualified/ trained specialists, long waitlists, costs; Boulanger et al., 2016; Campbell et al., 2020; Choinière et al., 2020; Hogg et al., 2012) and the COVID-19 pandemic has exacerbated difficulties with accessibility to care (Lacasse et al., 2021; Lynch et al., 2020). Therefore, self-help interventions have gained interest as they can be cost-effective and widely accessible. These interventions aim to "guide and encourage the patient to make changes… rather than just provide information" (Anderson et al., 2005) and can vary in format (e.g., delivered through a book or the Internet) and level of therapist guidance (French et al., 2017).

A growing number of studies support the use of ACT self-help interventions for psychological conditions such as anxiety and depression (French et al., 2017) and various physical conditions (Gillanders et al., 2017; Hofer et al., 2018; Proctor et al., 2018; Roche et al., 2017). Effect sizes vary across studies and outcomes. Some studies show small to moderate effects for symptom severity, anxiety, and depression (French et al., 2017; Gillanders et al., 2017; Proctor et al., 2018), while others show moderate to large effects

for anxiety, depression, stress, burnout, and psychological flexibility (Hofer et al., 2018; Proctor et al., 2018).

At present, randomized controlled trials (RCTs) examining the effects of ACT bibliotherapy for CP are scarce. Overall, results suggest that compared to a waitlist control or applied relaxation condition, individuals engaged in ACT bibliotherapy showed improvements in pain-related disability/ level of function, pain intensity, depression, anxiety, psychological inflexibility, quality of life and pain acceptance with moderate to large effect sizes (Johnston et al., 2010; Sullivan et al., 2018; Thorsell et al., 2011; Veillette et al., 2019). Some of these effects were maintained at 3, 6 and 12 month follow-ups. However, one RCT used a very small sample (N = 14; Johnston et al., 2010) and another included two face-to-face sessions and many telephone contacts with a therapist, which makes it harder to evaluate the effects specifically related to the book (Thorsell et al., 2011). Furthemore, two RCTs used waitlists rather than active control groups and both studies examining longer-term effects had high attrition rates (≥ 37%; Thorsell et al., 2011; Veillette et al., 2019), thus limiting generalizability of the findings.

A few pilot studies/ feasability trials (Fledderus et al., 2015; Ljótsson et al., 2014; Scott et al., 2018, 2021; Sullivan et al., 2018) and 5 randomized controlled trials (RCTs) have examined the effects of Internet-delivered ACT for CP. One RCT showed that compared to a treatment-as-usual condition, online ACT led to large improvements in fibromyalgia severity, depression and kinesiophobia and these were maintained at

3 months (Simister et al., 2018). One RCT found small to moderate improvements for pain acceptance, depression, anxiety and pain interference compared to an open chat forum; the effects were maintained or continued to improve at 6-months (Buhrman et al., 2013). Another RCT showed that participants who adhered to Internet-delivered ACT showed greater improvements in pain interference, depression, pain intensity, psychological inflexibility and pain catastrophizing compared to expressive writing and waitlist conditions (Trompetter et al., 2015). One RCT compared guided and unguided Internet-delivered ACT for CP to a waitlist condition and found that the guided ACT group showed moderate to large improvements in pain interference and acceptance (Lin et al., 2017). Finally, a more recent study comparing Internet-delivered ACT to a waitlist condition showed large effect sizes for pain interference and pain intensity, moderate effects for anxiety and depressive symptoms and small effects for quality of life and insomnia and improvements were maintained at 1-year follow-up (Rickardsson et al., 2021).

In sum, few studies have examined the efficacy of ACT self-help interventions for CP. Many included small sample sizes and used a waitlist control condition, which limits findings. Although ACT self-help interventions seem promising, more research is needed to better test their efficacy, particularly in comparison to active treatments (Trindade et al., 2021). Self-help interventions remain somewhat controversial (Rosen & Lilienfeld, 2016), and are often criticized for not being tested empirically. Furthermore, no study has directly compared formats. So, it is unknown which format is the most effective (e.g.,

bibliotherapy vs. Internet-delivered). A systematic review (French et al., 2017) reported mixed results, indicating computer-based/ audio interventions have better outcomes than bibliotherapy, but one of two cited studies dated from 1988 and refers to an audiocassette tape. Authors also reported that other research suggests that format delivery does not impact outcomes, but references are dated, and technology has greatly evolved since. Further investigation is clearly needed in this field to both understand the effectiveness of different formats and evaluate the maintenance of gains through time.

The current study aimed to evaluate the effectiveness of guided ACT self-help interventions (Internet-delivered and bibliotherapy) with minimal therapeutic contact, compared to a pain education program (active control condition) among adults living with CP. We hypothesized that (1) both ACT interventions would lead to larger reductions in pain-related disability (primary outcome), anxiety/ depressive symptoms and greater improvements in quality of life (secondary outcomes) than the education condition, and these improvements would be maintained at 3 and 6 months, (2) The Internet-delivered program would lead to greater improvements than the bibliotherapy condition for all outcome variables, (3) Participants from both ACT conditions would have a greater global impression of change compared to those of the education condition (at 3 and 6 month follow-ups).

Method

The current study was a RCT with two experimental conditions and an active control condition. The first group received access to an Internet platform with videos, interactive content and exercises based on ACT. The second group received a copy of a self-help book based on ACT for CP and had access to the book's website. The third group consisted of an active control group, in which participants received pamphlet style pdf documents of pain education (without any ACT components) as well as related practical exercises. The study has been approved by the University ethics committee of the principal investigator (CDERS -17-11-06.05) in February 2018 and Canadian Psychological Association ethical standards were followed. The study's protocol is registered (ClinicalTrials.gov Identifier: NCT03711851) and CONSORT guidelines (Moher et al., 2010) were followed.

Procedures

Participants were recruited between September 17 and 27 2018 (inclusively) with the help of various patient non-profit organisations and professional research associations for CP in the province of Quebec (Canada) such as the *Association québécoise de la douleur chronique* (AQDC), the Quebec Pain Research Network (QPRN), the *Société Québécoise de fibromyalgie*, and *Migraine Québec*. These associations posted study information on their website and e-mailed the information to their members. Study information was also posted on social networks (Facebook page with paid advertising). If interested, participants were invited to click on a link that directed them to the study information and

consent form webpage where they obtained more detailed information on the study and screened themselves for eligibility through a series of questions.

Subjects were selected for the study if they were: (1) 18 years or older, (2) residing in Canada, (3) having pain every day for at least six months, (4) having an average level of pain of at least 4/ 10 within the past week, (5) having reading and writing abilities in French equivalent or superior to grade 8, (6) having access to Internet at home and a valid e-mail address, (7) having non-cancer related pain, and (8) having stable medication for at least one month. Subjects were excluded if they (1) had previously engaged in an ACT-based psychotherapy and/ or had a regular meditation practice and/ or read the book being studied, and (2) were in a severe unstable psychological situation (severe suicidal thoughts or severe/ persistent mental health disorder).

Individuals who were excluded from the study were redirected to a new webpage with a list of resources. Individuals who met the eligibility criteria were asked to read and electronically sign the informed consent form and invited to complete the study baseline questionnaires (T1). Participants were asked to leave their contact information after completion of questionnaires so that research assistants could contact them to provide more information about the study via email and by telephone in September 2018.

Participants were randomized by the first author (MEM) in September 2018 after having completed baseline questionnaires. This was done blindly, using an independent

randomization website (Random Lists, 2018). The intervention itself started on October 8, 2018, and ended on December 9 2018. Participants were then invited to complete online questionnaires during the second week of December 2018 (T2). To estimate the effects of the interventions in the longer term, participants were invited to complete a further series of questionnaires 3 months post-intervention (T3), the week of March 10, 2019, as well as 6 months post-intervention (T4), the week of June 10, 2019.

Contact with participants was done by research assistants (trained undergraduate students in psychology). Two to three research assistants were assigned to each condition so they could be familiar with the content of each intervention program, and the principal investigators were available for support if needed. Prior to the start of the intervention (between September 29 and October 6, 2018), each participant was called (maximum duration of 15 minutes) by research assistants to explain study procedures and answer questions. Following these phone calls, books were immediately sent by mail to participants in the bibliotherapy condition. Every Monday morning for 9 weeks, emails were sent to participants in each condition explaining the assigned material and exercises for the week. Telephone scripts and emails were standardised as much as possible (same language, tone, similar lengths) as an attempt to prevent any potential biases. A second phone call (maximum duration of 15 minutes) was made by research assistants at Week 4 out of 9 to answer questions related to the material and support adherence to treatment (Titov et al., 2013, 2014; van Ballegooijen et al., 2014). Research assistants could always be reached via e-mail to answer questions or to help with technical support if necessary.

Duration of phone calls as well as number and reason for reception of emails were recorded by research assistants. The first phone call had an average duration of 5.64 minutes for the Internet-delivered ACT condition, 6.30 minutes for the ACT bibliotherapy condition, and 6.90 minutes for the education control condition, whereas the second phone call at mid-intervention (Week 4) had an average duration of 12.48 minutes, 7.67 minutes and 7.45 minutes, respectively.

Format of Interventions

Participants in the Internet-delivered condition received access to an Internet platform built specifically for this study with videos, interactive content, and exercises based on ACT for CP (see Appendix I for some photos). Participants in the bibliotherapy condition received a copy of a self-help book based on ACT for CP ("*Libérez-vous de la douleur*"; Dionne, 2014) and they had access to the book's website which includes audio mindfulness exercises only (Dionne, 2019). This website is very simplistic compared to the Web platform that the first condition had access to; the Internet-delivered condition essentially had similar content than in the book, but it was delivered in a more interactive manner with videos from one of the authors (FD), exercises to complete, and it also included video testimonies from people with CP.

The content of the education condition (active control) was based on the ACCORD program (French acronym which stands for *Concerted Application of Pain Knowledge and Resources*) which aimed to reduce the gap between the best possible care and the

actual care by using innovative and effective knowledge transfer strategies related to the prevention, diagnosis, and management of chronic pain. This program offers high quality pamphlet-style pdf documents (Association québécoise de la douleur chronique, 2017; Lalonde et al., 2015) (https://douleurchronique.org/ressources/centre-de-documentation/depliants/) which are two to three pages long and contain information on various pain-related topics (e.g. how to speak to your doctor, nutrition, the importance of physical activity, etc.). Some of the pamphlets are on meditation and acceptance – these have been purposely excluded from the study since they are essential components of ACT. The selected pdf documents were sent to participants via e-mail at the start of each week along with pdf/Microsoft Word documents containing exercises that generally asked participants questions and encouraged practical applications of that week's themes. The exercises were created as supplementary material by the second author (FD). For example, at week 9, themes were sleep habits and pain medication. Exercises included a list of questions for participants to answer about their sleep habits and a table to complete with daily information on pain intensity, daily activities, medication and positive/ negative effects which participants could complete and discuss with their doctor. Table 1 provides a summary of weekly content of interventions per condition.

Table 1

Weekly Content of Interventions per Group

Week	Internet-delivered ACT	ACT Bibliotherapy	Education
1	Module 1: Information on pain and the ACT approach Home exercises: - Thoughts, emotions, and sensations record - Quiz on chronic pain	Chapters 1 to 4 - Pain is physical - Pain is also emotional - You have the power to act on your pain - Stop the pain struggle (The ACT approach) Home exercises: - Thoughts, emotions, and sensations record - Quiz on chronic pain	Chronic pain: recognizing and treating it How to speak to your doctor Home exercises: - Write a list of question to ask my doctor - Reflect on how pain affects my daily functioning - Quiz on chronic pain
2	Module 2: Defining your deepest values Home exercises: - Mindfulness to values in daily life activities - Quiz what I can and cannot control	Chapter 11 Defining your deepest values Home exercises: - Mindfulness to values in daily life activities - Quiz what I can and cannot control	Don't stay alone in the face of pain! Home exercises: - Explore ways to improve your social life - Try some of these ways during the week
3	Module 3: Learn to meditate Home exercises: - Mindful breathing exercise (5 min, everyday) - Apply mindfulness in daily activities	Chapter 5 Learn to meditate in 5 minutes a day Home exercises: - Mindful breathing exercise (5 min, everyday) - Apply mindfulness in daily activities	Controlling your breath to relieve your pain: a solution for all Home exercises: - Practice Abdominal breathing
4	Module 4: Engage in action Home exercises: - Identify a SMART goal based on values - Mindfulness of breath and the body	Chapters 6 and 7 - Pass to ACT - Engage yourself in action Home exercises: - Identify a SMART goal based on values - Mindfulness of breath and the body	Physical activity to reduce pain… essential to treatment! Sexuality and intimacy Home exercises: - Identify a SMART goal about physical and/ or intimacy activities

Table 1

Weekly Content of Interventions per Group (continued)

Week	Internet-delivered ACT	ACT Bibliotherapy	Education
5		*Break – opportunity to catch up*	
6	Module 5: Open your arms to undesired sensations Home exercises: - Self-compassion mantras - Body scan	Chapters 8 and 13 - Open your arms to undesired sensations - Befriend your emotions, be kind and flexible Home exercises: - Self-compassion mantras - Body scan	When emotions get involved… Home exercises: - Learn to identify emotions in your daily life - List of activities and ways to adapt them
7	Module 6: Defuse from your thoughts Home exercises: - Defusion observation sheet - Leaves on the stream exercise	Chapters 9 and 10 - Wisely observe your thoughts - Defuse from your thoughts Home exercises: - Defusion observation sheet - Leaves on the stream exercise	To finish with stress! Home exercise: - Identity and relativize negative thoughts
8	Module 7: Finding the right balance in your activities Home exercises: - Pacing oneself and using mindfulness during activities - 3 minutes breathing exercise	Chapter 12 Be active at your own pace and in mindfulness Home exercises: - Pacing oneself and using mindfulness during activities - 3 minutes breathing exercise	Managing your energy to better control your pain Nutrition and chronic pain Home exercise: - Pacing oneself during activities in different ways

Table 1

Weekly Content of Interventions per Group (continued)

Week	Internet-delivered ACT	ACT Bibliotherapy	Education
9	Module 8: Conclusion Home exercise: - Surfing on the waves of emotions during mindfulness exercises - Monitor pain in relationship to medication	Chapters 14, 15 and Conclusion - Mindfully take your medication - Sleep better - It's just the beginning Home exercise: - Surfing on the waves of emotions during mindfulness exercises - Monitor pain in relationship to medication	Adopt good sleep habits Everything you need to know about pain medication Home exercise: - Identify and change bad sleep habits - Monitor pain in relationship to medication

Note. Chapters of the book were assigned in a different order than they appear chronologically in the book so that the ACT bibliotherapy group's content followed the Internet-delivered ACT group's content. The order of the content for the education group was also selected for each week in order to resemble as closely as possible material from ACT groups, as an attempt to standardize weekly content among groups as much as possible. Both ACT content (Internet-delivered and bibliotherapy) are based on Dahl et al. (2005), Dionne (2014), Hayes et al. (2012) and McCracken (2005) and mindfulness exercises are based on Segal et al. (2013). The title of the documents for the education group is a free-translation. Original documents in French can be found at https://douleurchronique.org/ressources/centre-de-documentation/depliants/

Measures

All questionnaires were self-administered online. A hyperlink was sent to participants via e-mail which automatically directed them to the Interactive Questionnaire Bank website, a secure website administered by the principal investigator's university. The completion time was estimated between 25 and 30 minutes for each of the four main measurement periods (pre, post and 3- and 6-month follow-up).

In addition to these 4 main measurement times, participants were also invited to answer a brief 7-item questionnaire assessing the 4 outcome variables and 3 axes of the

psychological flexibility model (open, aware, engaged) on a weekly basis, as well as one week prior to the start of the intervention and one-week post-intervention (for a total of 11 measures). These weekly items were part of a larger research project, and the data will be published in a separate paper.

Sociodemographic and Clinical Information

Participants answered questions related to socio-demographic information such as their age, sex, ethnicity, education, marital status, occupation, and annual income. Participants also answered a series of questions related to pain, such as the type of CP, number of years living with CP, and use of opioids. A question regarding the average intensity of pain experienced in the past week on a numerical rating scale ranging from 0 (*no pain)* to 10 (*worst pain imaginable*) was also included, along with questions related to healthcare use and disability benefits. A question about a recent diagnosis of a mental health condition was also included.

Primary Outcome

Pain-Related Disability. The *Modified Brief Pain Inventory* (BPI) is a 10-item questionnaire (Tyler et al., 2002) derived from the original 7-item version of this questionnaire (Cleeland, 2009; Cleeland & Ryan, 1994) to which three items were added. The BPI is widely used tool to evaluate pain interference in daily activities. Participants are asked to rate the degree to which pain interfered with various activities (e.g., general activity, mood, walking ability, work, relations with others, sleep, enjoyment of life,

personal care, recreational activities, social activities) in the past week. Items are rated on a Likert scale ranging from 0 (*does not interfere*) to 10 (*interferes completely*), and higher scores represent higher levels of pain interference on daily function. This questionnaire has been validated across a variety of populations (Cleeland & Ryan, 1994) and has been translated into various languages including French (Larue et al., 1991). The BPI is extensively used in CP research, has strong psychometric properties, and is recommended as an outcome in clinical trials of patients with CP (Dworkin et al., 2005). The internal consistency alpha coefficient obtained in the present study was equal to .89 for the Modified BPI.

Secondary Outcomes

Anxiety and Depressive Symptoms. The *Hospital Anxiety and Depression Scale* (HADS; Savard et al., 1998; Zigmond & Snaith, 1983) is a 14-item questionnaire which evaluates psychological distress in non-psychiatric hospital contexts. It included two 7-item subscales measuring anxiety and depressive symptoms. This questionnaire is frequently used for people with medical conditions as it excludes items associated to somatic symptoms that could be related (Hermann, 1997). Items are scored on a 4-point Likert scale ranging from 0 to 3 with varying anchors. Higher scores reflect the presence of higher anxiety and depressive symptomatology. A cut-off score of ≥ 10 was established for the anxiety subscale and a cut-off score of ≥ 7 for the depression subscale (Roberge et al., 2013). This questionnaire is widely used in research and clinical settings and has good psychometric properties in both English and French (Savard et al., 1998; Zigmond &

Snaith, 1983). The internal consistency alpha coefficient obtained in the present study was equal to .77 for the anxiety subscale and .82 for the depression subscale.

Quality of Life. The *World Health Organization Quality of Life Brief Scale* (WHOQOL-Bref; The WHOQOL Group, 1998) is a self-report measure containing 26 items which assess quality of life in terms of physical and psychological health, social relationships, environment and two global items which measure overall satisfaction with life and general sense of personal well-being. Items are rated from 1 (*very poor*) to 5 (*very good*), with higher scores reflecting better quality of life. Four domain scores can be calculated and multiplied by four to obtain scores comparable to the longer version of the questionnaire (WHOQOL-100). In the current study, one general facet score reflecting overall quality of life and general health were calculated. This measure has demonstrated good levels of internal consistency for its subscales ($\alpha = .66$ to $\alpha = .84$) and adequate test-retest reliability ($r = .75$; The WHOQOL Group, 1998). The French version of the instrument offers good internal consistency (Baumann et al., 2010). The internal consistency alpha coefficient obtained in the present study was equal to .89.

Adverse Events and Adherence to Treatment

To account for potential adverse events or negative side effects associated to the intervention as recommended by IMMPACT (Dworkin et al., 2005, 2009) and CONSORT guidelines (Moher et al., 2010), participants were asked at post-test if they experienced

any negative side effects following the intervention (for ex., intense pain, discomfort, etc.). Response choices were “no”, “somewhat” or “yes, please specify”.

To measure adherence to treatment, five questions were also included at this time point. Participants were asked to estimate how many weeks of the program they participated in (minimum = 1; maximum = 8). They were also invited to answer questions related to their reading of weekly emails, weekly material, practice of suggested exercises, and breathing and meditation exercises. Participants had the option to leave comments for the research team.

Following the Week 4 phone call, research assistants reported that some participants knew other subjects who had been assigned to different conditions, so they may have discussed/ compared/ shared content obtained from their respective condition with each other, thus contaminating the study’s design. As an attempt to take this information into account, we asked participants from the education condition at post-test if over the past 3 months they had engaged in an ACT psychotherapy, regularly practiced mindfulness meditation or read the book used for the bibliotherapy condition (one of the study’s exclusion criteria).

Patient Global Impression of Change and Percentage of Pain Relief

Participants were asked to rate their global impression of change in the past 3 months regarding their (1) pain, (2) physical functioning, and (3) psychological well-being using

a modified version of the Patient Global Impression of Change (PGIC; Dworkin et al., 2005; Guy et al., 1976) and a 7-point Likert scale ranging from 0 (*deteriorated considerably*); and 6 (*improved considerably*), with 3 (*remained unchanged*) being the middle point. Participants' perceived treatment response in terms of pain relief was assessed with 0-100 scale where 0 indicated "no pain relief" and 100 "complete relief" (Dworkin et al., 2005; Haythornthwaite & Fauerbach, 2001).

Other Measures

The battery of questionnaires used in this study also included the following measures: the *Multidimensional Psychological Flexibility Inventory* (MPFI; Rolffs et al., 2016), the *Chronic Pain Acceptance Questionnaire* (CPAQ-8; Fish et al., 2010; Scott et al., 2013), and the *French-Canadian Chronic Pain Self-Efficacy Scale* (FC-CPSES; Lacasse et al., 2015; Lorig et al., 1996). These questionnaires were included as part of a larger research project and will be included in further studies.

In addition to the 4 main measurement times, participants were also invited to answer a brief 7-item questionnaire assessing the 4 outcome variables and 3 axes of the psychological flexibility model (open, aware, engaged) on a weekly basis, as well as one week prior to the start of the intervention and one-week post-intervention (for a total of 11 measures). This questionnaire was based on a 3-item measure developed by Scott and McCracken (2017) to assess psychological flexibility, which was translated in French. The hyperlink to these questionnaires was included in each of the weekly emails during

the intervention, and with baseline and post-test questionnaires. These weekly items were included as part of a larger research project and data will be analysed in further studies.

Statistical Power

The sample size for this study was estimated to compare post-treatment pain-related disability between the 3 conditions. Considering the attrition of about 25% (between pretest and intervention) based on the calculations of Lin et al. (2015) to obtain a statistical power of 80% with an alpha of .05 and to detect an average effect size (d = .40) which proves clinically satisfactory for this type of study, a sample of 100 participants per group (300 in total) was required according to our calculations on G* power.

Data Analysis

Data were analyzed by a blinded independent biostatistician who was not informed of the study's hypothesis or conditions. Analyses were conducted using Version 26 of the Statistical Package for the Social Sciences (SPSS). Sums were calculated for the BPI and HADS if participants had completed at least 50% of the scales, as recommended by previous research (Bell et al., 2016; Cleeland, 2009) and for the WHO-QOL, sums were calculated if there were less than 20% of items missing (The WHOQOL Group, 1998).

One-way analysis of variance (ANOVA) and χ^2 tests were conducted to test whether groups were equivalent at baseline, and to test for any differences between participants who did and did not complete follow-up assessments. Mixed linear models (MLM) were

employed to analyse the effects of ACT self-help interventions compared with the education control condition for all variables studied. Mixed effects models include fixed as well as random effects to analyse score differences both between and within individuals over time. Estimation methods used were restricted maximum likelihood. The covariance structure was specified as composed symmetry. The treatment effects for the Internet-delivered ACT condition, the bibliotherapy condition, and education control condition over time (pre-, post-, and 3- and 6- month follow-up assessments) included the fixed effects (treatment group, time, treatment group by time interaction, age, sex, and level of education) and a random effect intercept.

To evaluate the proportion of participants showing clinically significant change on pain-related disability, IMMPACT recommendations were followed (Dworkin et al., 2008). More specifically, a change of 1 point on the BPI was considered a minimally clinically important change. Finally, to compare participants' global impressions of change following the intervention, chi-square tests were performed for items 2 (functioning), 3 (quality of life) and 4 (psychological well-being) of the PGIC, as these items are related to our outcome variables. The α significance level was set at .01 instead of .05 given that multiple statistical comparisons were carried out.

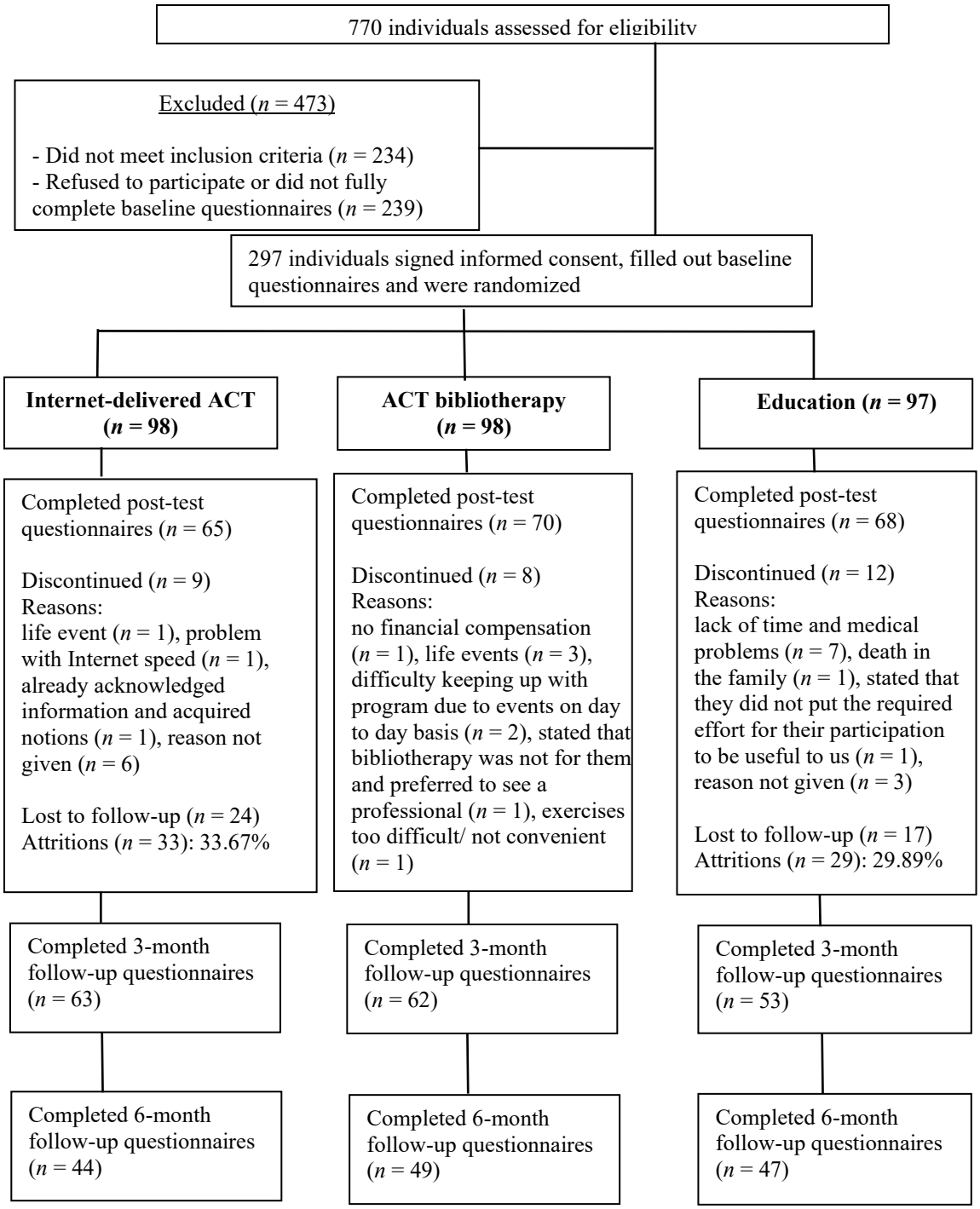
Results

Participant Flow Throughout the Study

A total of 770 individuals were interested in participating in the study and accessed the webpage. A total of 234 of them did not meet the inclusion criteria and 239 either refused to participate or did not fully complete the baseline questionnaires (total exclusion: $n = 473$). A total of 297 individuals were deemed eligible, provided consent, completed baseline questionnaires, and were randomized to one of the 3 treatment conditions (Internet-delivered: $n = 98$; bibliotherapy: $n = 98$; education: $n = 97$). Participant flow throughout the study is illustrated in Figure 1. We also asked participants to indicate how they heard about our study. The majority (≥ 76%) were recruited from associations for people with CP in the province of Quebec (Canada), and 191 individuals (65.2%) were recruited from one particular association (*Association québécoise de la douleur chronique*). As shown in Figure 1, participants asked to discontinue their participation for various reasons including major life events, lack of time, problems with Internet access and having previously seen similar content at a pain clinic despite being screened upon study entry about prior knowledge of ACT.

Figure 1

Participant Flow Throughout the Study



The initial attrition rates at post-test were 33.67% for the Internet-delivered ACT group, 28.57% for the ACT bibliotherapy group and 29.89% for the education control group. Attrition rates at 3-month follow-up were moderately higher: 35.71% for the Internet-delivered ACT group, 36.73% for the ACT bibliotherapy group and 45.36% for the education control group. However, total percentages of attrition rates after the 6-month follow-ups were much higher: 55.10% for the Internet-delivered ACT group, 50% for the ACT bibliotherapy group, and 51.54% for the education control group.

Adherence to Treatment

When asked how many weeks of the program they estimated to have completed, participants' answers were 7.18/8 weeks ($SD = 1.56$) for the Internet-delivered ACT group, 6.82/8 weeks ($SD = 1.46$) for the bibliotherapy group, and 7.39/8 weeks ($SD = 1.15$) for the education control group. Results from a simple one-way ANOVA showed no statistically significant difference between groups [$F_{(2, 182)} = 2.69$, $p = .07$].

When asked at post-test if over the past 3 months they had engaged in an ACT psychotherapy, regularly practiced mindfulness meditation or read the book used for the bibliotherapy group, 19/66 (28.79%) individuals from the education control group responded "yes". As such, data from these 19 participants was excluded from the analyses.

Length of Phone Calls

The first phone call (prior to the start of the intervention) had an average duration of 5.64 minutes for the Internet-delivered ACT group, 6.30 minutes for the ACT bibliotherapy group, and 6.90 minutes for the education control group. A simple one-way ANOVA revealed no significant difference between these times [$F_{(2, 245)} = 3.44$, $p = .034$] based upon criteria set forth.

The second phone call at mid-intervention (week 4/9) had an average duration of 12.48 minutes for the Internet-delivered ACT group, 7.67 minutes for the ACT bibliotherapy group and 7.45 minutes for the education control group. A simple one-way ANOVA revealed a significant difference between these times ($F_{(2, 226)} = 9.15$, $p = .000$) and post-hoc tests revealed that differences were between the Internet-delivered ACT group and ACT bibliotherapy group ($p = .001$) and the education control group ($p = .001$).

Research assistants in all three groups took note of general comments from participants during the week 4 phone call, and it seems research assistants from the Internet-delivered ACT group noted more technology related difficulties (e.g. participants not having received emails because they were in their junk mail folder, difficulties accessing the program's site, etc.).

Sociodemographic and Clinical Characteristics of the Sample

At baseline (N = 297), the sample was comprised of 90.4% (N = 265) of women, with a mean age of 51 years (*SD* = 11.53), and 95.5% (N = 277) of the sample was White/ Caucasian. Most individuals were married/ common law (58.9%, N = 172) and the lowest level of education was high school (19.8%, N = 58). As shown in Table 2, randomisation was successful as participants in the three groups seem comparable in terms of their sociodemographic, and clinical characteristics (all $p \geq .01$). Primary and secondary outcome variables were also comparable at baseline (all $p \geq .01$). Participants in all three groups appeared to have moderate levels of pain-related disability, mild symptoms of anxiety and depression, and moderate levels of quality of life prior to the intervention. Participants in our sample appeared to have comparable levels of pain intensity and slightly higher levels of anxiety and depression compared to a similar study and sample (Trompetter et al., 2015). No differences were found between participants who completed follow-up measures and those who did not.

Outcome Variables

Participants' scores on outcome measures are presented in Table 3. Results of the mixed linear models are presented in Table 4.

Table 2

Sociodemographic Characteristics of Sample

Participants' characteristics	Total Sample (N = 297)		Internet-delivered Group (*n* = 98)		Bibliotherapy Group (*n* = 98)		Education Group (*n* = 97)	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Age	51.06	11.53	50.97	11.23	50.85	11.67	51.37	11.81
Pain intensity at baseline (0-10)	6.17	1.39	5.96	1.36	6.40	1.43	6.14	1.35
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Sex								
Female	265	90.4	88	89.8	91	91.9	86	89.6
Male	28	9.6	10	10.2	8	8.1	10	10.4
Ethnicity								
White/ Caucasian	277	95.5	91	93.8	94	96.9	92	95.8
Others	13	4.4	6	6.2	3	3.1	4	4.1
Occupational status								
Working part-time or full-time	90	30.7	35	35.7	30	30.3	25	26.1
Disability	103	35.1	32	32.6	32	32.3	39	40.7
At home	17	5.8	5	5.1	7	7.1	5	5.2
Retired	58	19.8	16	16.3	20	20.2	22	22.9
Other	25	8.5	10	10.2	10	10.1	5	5.2
Education level								
High School	58	19.8	14	14.3	21	21.2	23	24
Professional studies (diploma/ cegep)	121	41.3	44	44.9	40	40.4	37	38.5
University – undergraduate level	80	27.3	24	24.5	29	29.3	27	28.1
University – graduate level	34	11.6	16	16.3	9	9.1	9	9.4

Table 2

Sociodemographic Characteristics of Sample (continued)

Participants' characteristics	Total Sample (N = 297)		Internet-delivered Group (*n* = 98)		Bibliotherapy Group (*n* = 98)		Education Group (*n* = 97)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Marital Status								
Single	68	23.3	24	24.5	21	21.4	23	24
Married or common law	172	58.9	55	56.1	58	59.2	59	61.5
Separated or divorced	48	16.4	17	17.3	18	18.4	13	13.5
Widowed	4	1.4	2	2	1	1	1	1
Family income (gross)								
Less than $20,000	54	18.4	19	19.4	12	12.1	23	24
Between $20,000 and $49,999	81	27.7	32	32.7	25	25.2	24	25
Between $50,000 and $79,999	55	18.8	16	16.4	23	23.2	16	16.7
Between $80,000 and $119,999	50	17.1	18	18.4	15	15.2	17	17.8
$120,000 and more	19	6.5	3	3.1	11	11.1	5	5.2
I prefer not to answer	34	11.6	10	10.2	13	13.1	11	11.5
Number of years living with pain								
Between 6 and 12 months	4	1.4	2	2.0	2	2.0	-	-
Between 12 and 24 months	26	8.9	5	5.1	13	13.1	8	8.3
Between 3 and 4 years	41	14.0	13	13.3	16	16.2	12	12.5
Between 5 and 6 years	21	7.2	8	8.2	5	5.1	8	8.3
7 years or more	201	68.6	70	71.4	63	63.6	68	70.8

Table 2

Sociodemographic Characteristics of Sample (continued)

Participants' characteristics	Total Sample (N = 297)		Internet-delivered Group (*n* = 98)		Bibliotherapy Group (*n* = 98)		Education Group (*n* = 97)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Primary type of chronic pain								
Headaches and migraines	19	6.5	2	2.0	6	6.1	11	11.5
Fibromyalgia	119	40.6	37	37.8	39	39.4	43	44.8
Back pain	35	11.9	11	11.2	12	12.1	12	12.5
Neck pain	13	4.4	7	7.1	4	4.0	2	2.1
Neuropathic pain	18	6.1	8	8.2	7	7.1	3	3.1
Musculoskeletal pain	34	11.6	16	16.3	6	6.1	12	12.5
Arthritis	11	3.8	5	5.1	5	5.1	1	1.0
Chronic post-surgical pain	7	2.4	1	1.0	3	3.0	3	3.1
Complex regional pain syndrome	6	2.0	2	2.0	4	4.0	-	-
Other	31	10.6	9	9.2	13	13.1	9	9.4
Use of opioids								
Yes	120	41.1	34	34.7	40	40.8	46	47.9
No	172	58.9	64	65.3	58	59.2	50	52.1
Psychological diagnosis								
Yes	97	33.2	37	37.8	30	30.3	30	31.6
No	195	66.8	61	62.2	69	69.7	65	68.4

Note. Data are missing on some variables.

Table 3

Mean Scores in the Three Intervention Groups at Baseline (T1), Post-Intervention (T2), and 3- Month (T3) and 6-Month Follow up (T4)

Dependent variable	Measurement time	Internet-delivered ACT Group			ACT Bibliotherapy Group			Education Control Group			Range of scores
		Mean	*SD*	N	Mean	*SD*	N	Mean	*SD*	N	
Pain-related disability (BPI)	T1	52.30	16.35	93	58.58	18.07	93	57.77	18.32	91	0 to 100
	T2	43.98	20.83	53	42.51	21.60	67	52.08	23.32	62	
	T3	45.39	21.84	57	42.78	24.66	58	53.32	23.54	47	
	T4	44.02	21.47	42	43.36	25.67	45	44.14	23.14	44	
Anxiety symptoms (HADS, anxiety subscale)	T1	8.41	3.66	98	8.86	3.00	97	8.64	3.09	96	0 to 21
	T2	7.95	3.91	62	7.10	3.46	69	8.02	3.29	63	
	T3	7.51	3.71	58	7.42	3.36	61	7.92	3.34	52	
	T4	7.65	4.02	43	7.83	3.57	47	7.98	3.34	45	
Depressive symptoms (HADS, depression subscale)	T1	9.12	4.07	98	9.44	3.93	97	9.51	3.55	96	0 to 21
	T2	7.90	4.05	62	7.45	3.97	69	8.70	4.21	64	
	T3	7.73	4.07	58	8.19	3.54	61	8.79	4.58	52	
	T4	7.72	4.71	43	8.28	4.16	47	7.87	3.80	45	
Quality of life (WHO-QOL)	T1	76.49	13.49	80	75.09	14.18	75	74.46	13.20	78	26 to 130
	T2	82.57	16.07	47	85.55	14.22	53	78.08	15.62	52	
	T3	83.40	15.72	44	81.54	12.47	50	77.30	19.12	46	
	T4	80.05	18.60	39	82.46	14.49	37	80.58	18.62	40	

Note. BPI Brief Pain Inventory, HADS-A Hospital Anxiety and Depression Scale – Anxiety Subscale, HADS-D Hospital Anxiety and Depression Scale – Depression Subscale, WHO-QOL World Health Organization Quality of Life Brief Scale. Means of total scores are presented.

Table 4

Results of the Mixed Linear Models of Treatment Effects on Primary and Secondary Outcome Variables

Variable	*df1*	*df2*	*F*	*p*
Primary Outcome				
Pain-related disability (BPI)				
Group	2	455.80	3.03	.049
Time	3	263.65	15.15	.000*
Group x Time	6	263.54	1.93	.077
Age	1	651.037	.011	.915
Sex	1	663.64	3.48	.063
Level of education	1	655.36	7.66	.006*
Secondary Outcomes				
Anxiety symptoms (HADS-A)				
Group	2	476.77	.16	.854
Time	3	267.29	4.88	.003*
Group x Time	6	267.11	.72	.635
Age	1	683.60	1.76	.185
Sex	1	690.18	17.35	.000*
Level of education	1	683.69	14.32	.000*
Depressive symptoms (HADS-D)				
Group	2	470.67	1.00	.368
Time	3	262.65	6.82	.000*
Group x Time	6	262.52	.46	.840
Age	1	689.60	1.63	.202
Sex	1	692.34	21.65	.000*
Level of education	1	686.80	14.71	.000*
Quality of life (WHO-QOL)				
Group	2	434.30	3.36	.036
Time	3	254.92	6.85	.000*
Group x Time	6	254.89	.55	.771
Age	1	671.13	1.76	.186
Sex	1	679.96	4.78	.029
Level of education	1	670.16	13.16	.000*

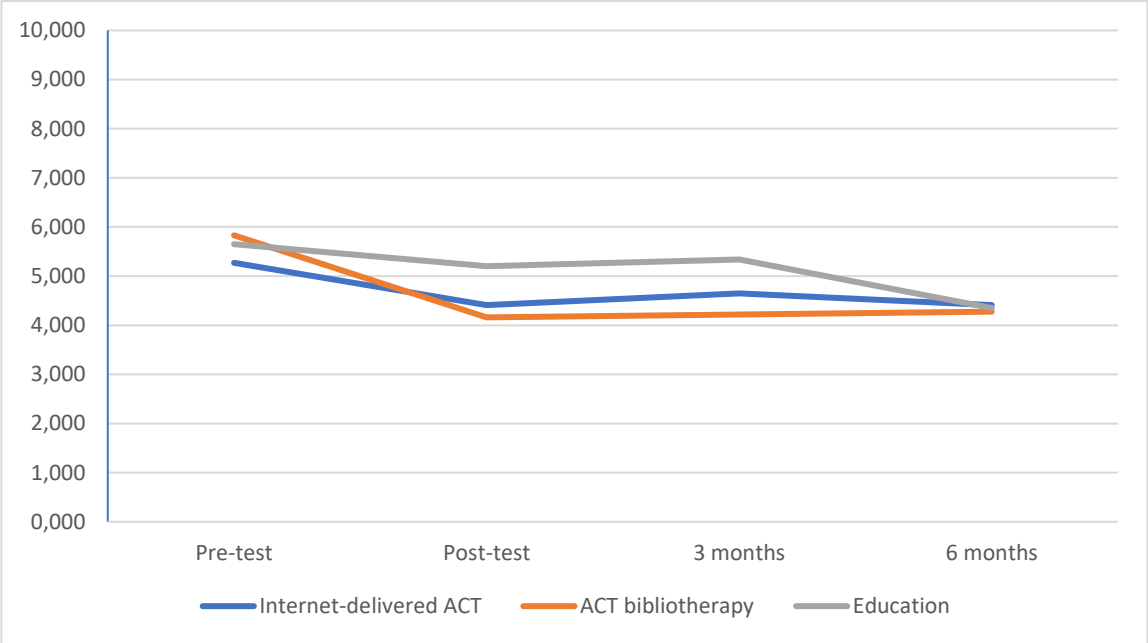
Note. BPI Brief Pain Inventory, HADS-A Hospital Anxiety and Depression Scale – Anxiety Subscale, HADS-D Hospital Anxiety and Depression Scale – Depression Subscale, WHO-QOL World Health Organization Quality of Life Brief Scale, $p \leq .01$

Primary Outcome: Pain-Related Disability

With regards to the primary outcome, mixed linear model (MLM) results showed a statistically significant effect for time [$F_{(3, 263.65)} = 15.15$, $p = .000$], indicating that scores of pain disability reduced in all three groups with time. Results are illustrated in Figure 2. As shown in Table 3, the differences reached clinical significance---i.e., ≥ 1-point change in score on BPI18 (Dworkin et al., 2008). Results also showed a significant main effect for education level [$F_{(1, 655.36)} = 7.66$, $p = .006$], suggesting that the higher the participants' education level, the lower were their pain disability scores. No significant main effect was found for condition and there was no significant interaction effect between time and condition.

Figure 2

Mean Pain-Disability Scores in the Three Groups at Each Time Point



Secondary Outcomes: Anxiety, Depression, and Quality of Life

Results of the MLM models revealed that time was significant with anxiety symptoms [$F_{(3, 267.29)} = 4.88$, $p = .003$], depressive symptoms [$F_{(3, 262.65)} = 6.82$, $p = .000$] and quality of life [$F_{(3, 254.92)} = 6.85$, $p = .000$] improving as the trial progressed. Furthermore, main effects for sex were obtained for anxiety ($F_{(1, 690.18)} = 17.35$, $p = .000$] and depression [$F_{(1, 692.34)} = 21.65$, $p = .000$], indicating that women had lower scores of anxiety and depression than men. Results also showed significant main effects of participants' education level for anxiety [$F_{(1, 683.69)} = 14.32$, $p = .000$], depression [$F_{(1, 686.80)} = 14.71$, $p = .000$], and quality of life [$F_{(1, 670.16)} = 13.16$, $p = .000$], suggesting that the higher the participants' education level, the lower were their anxiety and depression scores and the higher were their quality of life scores. No significant main effects were found for conditions and there were no significant interaction effects between time and conditions.

Global Impression of Change

Participants' responses to the PGIC were grouped into two categories: "improvement" (responses ranging from 4 to 6 on the 7-point Likert scale) and "no change or deterioration" (responses ranging from 0 to 3; see Table 5). Results of chi-square tests showed no statistically significant differences between groups in terms of participants' impression of improved functioning, quality of life and psychological well-being (all p-values > .01).

Table 5

Participants' Global Impressions of Change Following the Interventions

PGIC items		Internet-delivered ACT Group	ACT Bibliotherapy Group	Education Control Group	Total
Functioning	No impression of change or deterioration	35	28	40	103
	Impression of improvement	25	40	20	85
	Total	60	68	60	188
	Total % Improved	41.7%	58.7%	33.4%	-
Quality of life	No impression of change or deterioration	31	30	40	101
	Impression of improvement	29	38	20	87
	Total	60	68	60	188
	Total % Improved	48.3%	55.8%	33.4%	-
Psychological well-being	No impression of change or deterioration	27	25	35	87
	Impression of improvement	33	43	25	101
	Total	60	68	60	188
	Total % Improved	55%	63.2%	41.6%	

Negative Effects

The majority of the sample (N = 152/182, 83.5%) denied having experienced negative effects following the intervention. A total of five individuals reported negative effects (N = 4 in ACT bibliotherapy and N = 1 in the education group) and 25 reported "somewhat" of negative effects related to the intervention (N = 12 in Internet-delivered

ACT, N = 6 in ACT bibliotherapy and N = 7 in the education group). Participants had the option to leave comments to the research team following this question, and two participants indicated that they experienced an increase in pain following the start of the intervention or halfway through the intervention. Another participant indicated that they restarted yoga during the program and spent 3 days in bed afterwards and repeated this 3 times with the same outcome. Other participants who had indicated no negative side effects commented in this section that they expected more therapeutic support throughout the course of the program. There were some missing data (n = 21) for the item measuring negative effects.

Discussion

At present, a few studies have supported the effectiveness of ACT self-help for CP, but the evidence is limited because only two studies have compared it to active control conditions (applied relaxation and expressive writing; Thorsell et al., 2011; Trompetter et al., 2015). Therefore, the current study fills a gap in the literature as it compares ACT guided self-help to an active control (education) for CP, in addition to being the first to directly compare two formats of ACT self-help (Internet-delivered and bibliotherapy) while using a large sample (N = 297). Results showed significant effects of small magnitude for time, meaning that all three conditions led to improvements in pain-related disability, anxiety, depression, and quality of life over time. These results are encouraging as they suggest that overall, a 9-week self-help intervention with minimal therapist contact can help improve outcomes in people living with CP.

Several studies support the effectiveness of ACT for CP (Veehof et al., 2016). Education on pain has also shown benefits but is often used in combination to another intervention rather than a stand-alone treatment (Joypaul et al., 2019). Therefore, it was expected that ACT self-help, regardless of format, would lead to greater outcomes than education. However, both ACT interventions did not appear to be superior to education for any outcome. One possible explanation for the lack of significance between groups is that participants in our sample had low levels of anxiety and depression and average levels of quality of life at baseline (below clinical cut-offs), which can reduce the range of possible improvements. Interestingly though, results from an exploratory clinical trial comparing psychoeducational relaxation therapy (PRT) to PRT followed by ACT showed that both interventions were effective for CP and the addition of ACT did not significantly impact results (Roslyakova et al., 2020). This raises the question as to whether gains from the current study are attributable to ACT processes or perhaps to non-specific ingredients (e.g. receiving emails and phone calls, participants activating themselves through various exercises regardless of modality).

We had also hypothesized that the Internet platform would lead to better outcomes than the book due to its interactive nature. Although the scientific literature suggests that there may not be differences between various intervention formats (French et al., 2017; Heapy et al., 2015), research that has taken interest in this question have mostly compared other self-help modalities. To our knowledge, no study had yet directly compared bibliotherapy to Internet-delivered interventions. Still, our results support previous

research, as no significant difference was found between the two ACT self-help interventions. Given that neither one appears to be superior to the other, choices on format could be left up to participants based on individual preferences.

Our results showed significant main effects of sex on anxiety and depression, indicating that women had lower anxiety and depression scores than men. The proportion of women in our sample (90.4%) seems high but is common compared to other studies. Nevertheless, this could have influenced this effect. Previous research has suggested that sex may moderate responses to pain management interventions (Keogh, Bond et al., 2005). Pain acceptance has been shown to help women cope better with pain in an experimental study, but no effect was found for men (Keogh, Bond et al., 2005). Another similar study has shown that men, but not women, benefited from focusing on pain (Keogh, McCracken et al., 2005). These studies were conducted among healthy adults and not people with CP, but it may be possible that effectiveness of interventions/ coping strategies differ among sex. Therefore, it would be interesting for future studies to explore CP interventions that may appeal and benefit more specifically to men.

Additionally, results showed significant main effects of education level on pain disability, anxiety, depression, and quality of life. The higher the participants' education level, the lower were pain disability, anxiety, and depression scores and the higher were quality of life scores. Previous research indicates that prevalence of CP is higher among adults with lower levels of education (Dahlhamer et al., 2018) and that adults with lower

education/ low literacy are less likely to begin and complete treatment (Thorn et al., 2011). In the current study, changes may have been influenced by participants' ability to understand the material and put things in perspective on their own. While ACT has been shown to be effective with various groups, ACT-related concepts such as acceptance and mindfulness can seem rather abstract and could be more challenging to grasp when delivered via self-help compared to in-person. Furthermore, the computer literacy of the general chronic pain population may have also impacted uptake. Therefore, future research should aim to tailor and test interventions that will be most effective for adults with lower education/ literacy.

Finally, participants in all three conditions showed some degree of positive impressions of change following the intervention, but participants in the ACT conditions did not show greater impressions of change than the education control condition. This could be due to high attrition rates. Post-test attrition rates were comparable to those previously found in the literature (Lin et al., 2017; Melville et al., 2010). Six-month follow-up attrition rates were similar to the one obtained at the 3-month follow-up (46.9%) of a previous study comparing ACT bibliotherapy to a waitlist condition (Veillette et al., 2019). Nonetheless, results obtained for all three conditions on primary and secondary variables were maintained at three and six months. This indicates that regardless of content or modality, participants in all conditions reported improvements to their condition that lasted with time.

The current study has several limitations. First, participants were self-selected, introducing the possibility of a selection bias. It is possible that individuals who chose to take part in the study had greater motivation or different characteristics than other individuals with CP in the community. Second, our sample consisted mostly of women with a mean age of 51 (*SD* = 11.53), which may compromise the generalizability of our results. It would be interesting for future studies to investigate treatment effectiveness and satisfaction based on age and gender across different self-help modalities, as responsiveness could vary based on these factors.

Third, the study had a high attrition rate, notably at follow-up measures (≥ 50%). We don't know why participants dropped out of treatments and this may be valuable information. A qualitative systematic review and meta-synthesis suggests high attrition rates in CP self-management interventions could be in part due to difficulties sustaining motivation (Devan et al. 2018). In the present study, high attrition rates could potentially be reflective of a greater need for support. Thus, it could be beneficial for future studies to take interest in patient dropout in order to better understand why a large proportion of patients drop out and ultimately, help find strategies to help improve outcomes. Also, in this study adherence to treatment and measures were self-reported, which introduces the possibility of bias. It would have been relevant to obtain more objective measures of adherence. It is noteworthy as well that compared to other studies on Internet-delivered self-help, participants did not have access to any live interactions or discussion forums and the technology may not have been as developed as in other studies. This could

potentially help explain the high attrition rates as well as the smaller effects obtained in the current study, as greater technological advancements and more therapist contacts could possibly help increase participant engagement and improve outcomes. In fact, for the current study, the average duration of the Week 4 phone call was longer for the Internet-delivered group compared to the other two groups and research assistants noted more technology-related difficulties. These could have impacted participants' engagement and overall acceptability of the intervention, and it would be important for future studies to consider. Moreover, it is important to keep in mind that this study's data was collected in 2018. The COVID-19 pandemic may have influenced people's use of technology and comfort with self-help, and there have also been significant advances in technology since then (e.g., see Gentili et al., 2021 and Hauser-Ulrich et al., 2020).

Fourth, research assistants and participants were not blinded. Although research assistants were not informed of the study's hypothesis, they were trained at the same time and informed of the various conditions, and they communicated with each other which could have potentially induced a bias. Although we attempted to control for this by asking about familiarity with mindfulness/ ACT while screening for eligibility, it did not prevent that participants from the education control condition could have encountered these concepts outside the context of the study between time of eligibility screening and 6-month follow-up. As such, nearly one third of participants in the education control condition became familiar with ACT concepts or mindfulness throughout the study, and their data was excluded from the analyses, but this could have very well influenced results.

Despite these limitations, this study was one of the few to compare ACT guided self-help for CP to an active control, in addition to being the first to directly compare two formats of ACT self-help for CP. Overall, results support the effectiveness of self-help interventions with minimal therapist support for CP. With time, results in all three conditions showed reductions in pain-related disability, anxiety, and depressive symptoms as well as improvements in quality of life. Additionally, participants also had a positive impression of change following the intervention.

With the COVID-19 pandemic, barriers to traditional face-to-face psychological interventions have grown significantly and the need for more creative and accessible treatment modalities has become apparent. Self-help interventions are a cost-effective solution that can be widely accessible to people for a range of conditions including CP. Although the study results are promising, more research is needed to better understand how self-help interventions lead to change over time in order to optimize these interventions. Moreover, given that CP patients are a heterogenous group, future research should examine who can benefit from these interventions and who may need greater therapist support.

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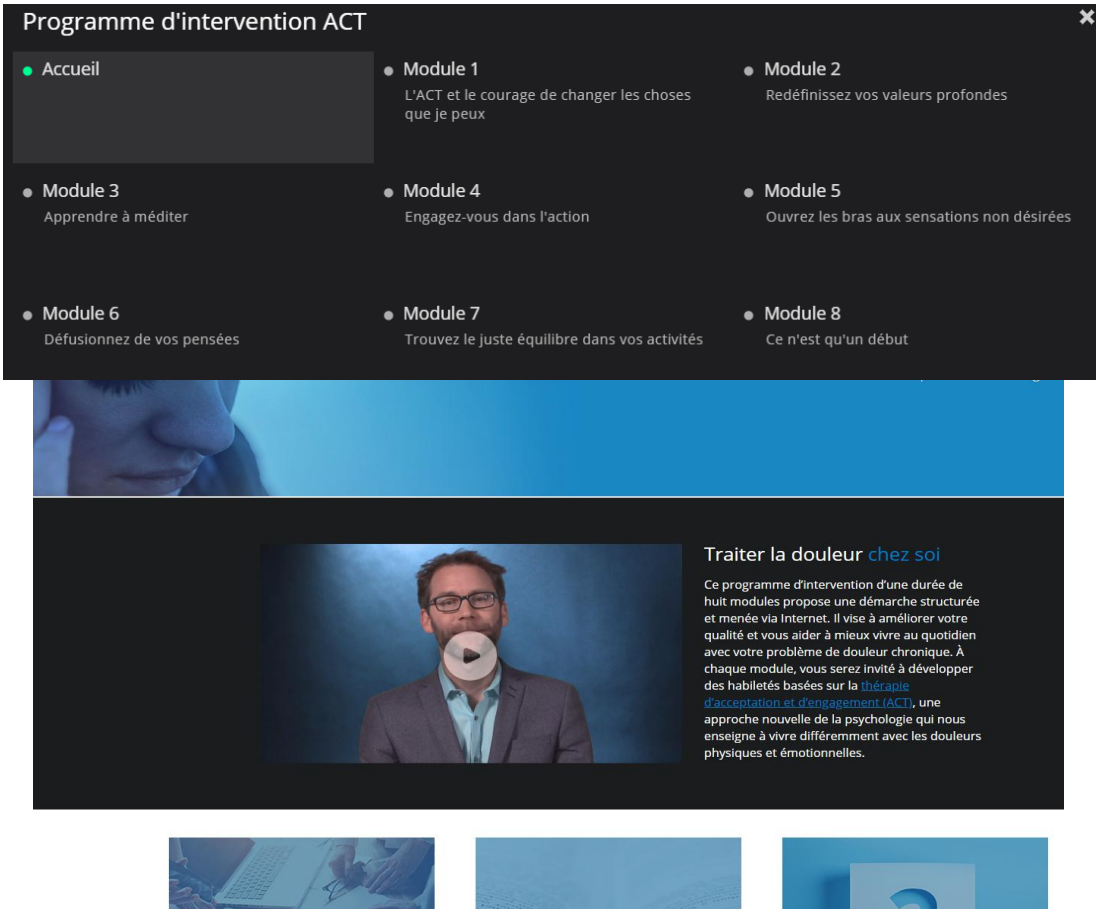
Appendix I

Photos From the Internet-Delivered ACT Intervention



Chapitre 2

Trajectories of change in pain disability in a randomized controlled trial of self-help Acceptance and Commitment Therapy for chronic pain

Trajectories of change in pain disability in a randomized controlled trial of self-help Acceptance and Commitment Therapy for chronic pain

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Abstract

Objectives: Acceptance and Commitment Therapy (ACT) is a well-supported treatment for chronic pain. In recent years, self-help ACT interventions have become increasingly popular, but little is known about the trajectories of change for individuals using these interventions. This study aims to (1) identify and describe various trajectories of change in pain-related disability during self-administered interventions for pain, (2) identify characteristics, treatment modality and baseline predictors of trajectory membership, and (3) identify trajectory groups associated with greater/poorer outcomes. This will be done using data from a RCT comparing Web-based and bibliotherapy ACT interventions for chronic pain to an active control group receiving education on pain. **Methods:** A total of 297 adults with chronic pain were randomized into one of three conditions. Questionnaires measuring pain disability and psychological constructs were completed at baseline, post-intervention and three- and six-month follow-ups, in addition to weekly diary items measuring pain disability during the 9 week-intervention. Growth mixture modeling was used to achieve aims 1 and 2 and chi-square tests to achieve aim 3. **Results:** Four distinct trajectories of pain disability were identified with different rates of change over time. Overall, results showed that lower levels of baseline pain disability and anxiety, as well as higher quality of life, psychological flexibility, and self-efficacy predicted lower pain interference throughout the intervention. Group allocation was associated with trajectory membership: participants in the trajectory with lower pain disability were more likely to be in the ACT bibliotherapy group and participants in the very high pain disability/stable with time trajectory group were more likely to be in the Web-based ACT group. **Discussion:** Results can help inform the use of self-help interventions and may

indicate, for example, that individuals with greater disability and distress may need more therapeutic guidance before they can benefit from self-help.

Keywords: Acceptance and Commitment Therapy (ACT), Chronic Pain, Self-Help Intervention, Trajectories of Change.

Introduction

Chronic pain is a debilitating condition, often interfering with people's ability to complete daily activities (Choinière et al., 2010; Dueñas et al., 2016). Acceptance and Commitment Therapy (ACT; Hayes et al., 2012) is considered an evidence-based treatment for chronic pain, with strong research support (American Psychological Association, 2016), and it has been shown to help improve pain-related functioning (Veehof et al., 2016). Although there is plenty of empirical evidence to support the effectiveness of ACT for chronic pain (see Martinez-Calderon et al., 2024 for an overview of systematic reviews with meta-analysis) and even though pain relief is a fundamental human right (Cousins & Lynch, 2011), people living with pain often face challenges accessing care (e.g., a limited number of qualified/trained specialists, long waitlists, financial costs, distance to urban centres where these services are usually offered, difficulties linked to mobility or transport, participant reluctance to engage in face-to-face treatment due to prejudice or stigma; Boulanger et al., 2016; Campbell et al., 2020; Choinière et al., 2020; Hogg et al., 2012). In recent years, increasing efforts have been made to democratize access to ACT based interventions with the use of self-help modalities. These interventions aim to "guide and encourage the patient to make changes… rather than just provide information" (Anderson et al., 2005; cited in French et al., 2017) and they can vary in format (e.g., delivered through a book, a Web platform or mobile application) as well as level of therapist guidance (French et al., 2017). Despite the growing number of studies supporting the use of various formats of self-help ACT interventions for chronic pain (Johnston et al., 2010; Martel et al., 2024; Rickardsson et

al., 2021; Sullivan et al., 2018; Thorsell et al., 2011; Trindade et al., 2021; Veillette et al., 2019), little is known about the patterns of change for individuals engaging in these interventions.

Most studies conducted so far have been randomized controlled trials (RCTs) that compared average pain disability scores across patient groups at various time points. Although results have generally been encouraging, such statistical methods limit our understanding of individual variability through time. In other words, not all individuals respond to self-help interventions in the same way and there may be subgroups of individuals who respond better or worse to these types of interventions. Additionally, some participants may benefit early on, whereas others may take longer to see therapeutic gains. More person-centred statistical analyses such as growth mixture modelling appear particularly useful to provide this type of information as they can help identify patterns of change over time by empirically grouping together individuals with similar patterns of change (Curran et al., 2010; Frankfurt et al., 2016). Conducting research to better understand various patterns of change over time is consistent with recommendations from the *Association for Contextual Behavioral Science*'s Task Force (Hayes et al., 2021), namely, to include more idiographic and longitudinal-based research.

To our knowledge, there are only two studies that have examined trajectories of change in ACT interventions for chronic pain. The first study (Vowles et al., 2017) examined changes in pain intensity and pain-related distress during an interdisciplinary

ACT program for chronic pain. Results showed a single latent trajectory with a decreasing quadratic slope for pain intensity and two distinct trajectories for pain related distress: one of linear decrease over the 4 weeks of the program (70.3% of participants were most likely classified in this class) and the other was characterized by an early increase over the first weeks of treatment followed by a more rapid decrease close to baseline levels over the final weeks of treatment (29.7% of participants belonged to this class). The second study examined trajectories of change in values-related activities (one of the six processes of the ACT psychological flexibility model) during an interdisciplinary ACT-based program over four weeks (Vowles et al., 2019). Results showed that a single linear trajectory class best characterized changes in values during treatment, indicating that scores on a measure of valued actions improved over time during the intervention. To our knowledge, no study has yet looked at trajectories of change in self-help ACT interventions for chronic pain.

Moreover, our knowledge of predictors of change in self-help ACT interventions for chronic pain is also quite limited. One study looked at predictors of change in a 9-to-12-week Web-based ACT intervention compared to expressive writing and wait-list control groups (Trompetter et al., 2016). Results indicated that higher pain interference, depression and anxiety, and lower levels of emotional well-being predicted higher pain interference six months later. However, other studies looking more broadly at various interventions for chronic pain have failed to identify reliable predictors of outcomes (McCracken & Turk, 2002; see Gilpin et al., 2017, for a systematic review). Demographic predictors have been inconsistent across studies but mostly non-significant and it would

be relevant for studies to take interest in psychological flexibility processes as predictors to ACT interventions (Gilpin et al., 2017). Overall, our understanding of within-treatment change over the course of ACT self-help interventions for chronic pain remains limited. Looking more closely at distinct trajectories of change in pain-related disability and identifying patient characteristics and baseline predictors associated with greater/poorer outcomes could provide useful information to better tailor interventions and appropriately allocate resources.

The current study aims to (1) identify and describe various trajectories of change in pain-related disability during self-administered interventions for pain, (2) identify characteristics, group allocation and baseline predictors of trajectory membership, and (3) identify trajectory groups associated with greater/poorer outcomes. This will be done using data from an RCT comparing two guided self-help ACT interventions (Internet-delivered and bibliotherapy) to an active control group receiving education on pain. Outcomes have already been reported (Martel et al., 2024), and results of mixed linear models showed a statistically significant main effect for time on pain disability ($F = 15.15$, $p = .000$) for all three interventions.

Materials and Methods

Participants and Procedures

Participants were recruited with the help of various patient non-profit organizations and professional research associations for CP. Participant sociodemographic information

and initial outcomes for the present randomized controlled trial (RCT) have already been reported (see Martel et al., 2024) and only measures relevant to the present study are reported here.

All measures were assessed at pretreatment (T0; one week prior to start of treatment), posttreatment (T2; one week after completing treatment) and three (T3) and six-month (T4) follow-ups. Participants also received e-mails from research assistants inviting them to complete weekly diary items for the two first weeks prior to starting treatment, as well as at the start of each week throughout the course of treatment, for a total of 10 time points (T1). Participants were invited to complete weekly diary items as well as post-treatment and follow-up measures even if they did not complete all treatment modules. The content of the ACT treatment for chronic pain is described in the main outcome study (see Martel et al., 2024, for more information). Briefly, it included information on pain and the ACT approach, and modules on values, mindfulness meditation, committed actions, acceptance, cognitive defusion, pacing and monitoring pain in relation to medication.

Treatment Conditions

The current study was a RCT with two experimental conditions and an active control condition. The first group received access to an Internet platform with videos, interactive content and exercises based on ACT. Over the course of 9 weeks (with a break at week 5/9), participants were invited to complete the module assigned for the week. The second group received a copy of a self-help book based on ACT for CP and had access to the

book's website, which is very simplistic compared to the Internet platform of the first group and only included audio mindfulness exercises. Although participants had a physical copy of the book and could read at their own pace, they received weekly emails from research assistants guiding them to read the book in a specific order, and as such, following the themes of the Internet-delivered ACT group. The third group consisted of an active control group, in which participants received pamphlet style pdf documents each week on pain education (without any ACT components) as well as related practical exercises. In addition to weekly emails received for each group, participants also received two phone calls from research assistants (trained undergraduate students in psychology): one prior to the start of the intervention, and at week 4/9 to answer questions related to the material and support adherence to treatment. Research assistants could also be reached via email to answer questions or help with technical support if needed. The study has been approved by the University ethics committee of the principal investigator (CDERS -17-11-06.05) in February 2018 and (country name removed for anonymized review) ethical standards were followed. The study's protocol is registered (ClinicalTrials.gov Identifier: NCT03711851).

Measures

Numeric Rating Scale for Pain Intensity

Participants were asked to rate the average pain they experienced in the past week on a numerical rating scale ranging from 0 (*no pain)* to 10 (*unbearable pain*). According to previous research, this type of numerical scale is a reliable measure of pain intensity.

Pain Disability

The *Modified Brief Pain Inventory* (BPI) is a 10-item questionnaire (Tyler et al., 2002) developed from the initial 7-item version of this questionnaire (Cleeland, 2009; Cleeland & Ryan, 1994) to which three items were added. The BPI is a commonly used measure to evaluate pain interference in daily activities. Items require participants to rate the degree to which pain interfered with various activities (e.g., general activity, mood, walking ability, work, relations with others, sleep, enjoyment of life, personal care, recreational activities, social activities) in the past week on a Likert scale ranging from 0 (*does not interfere*) to 10 (*interferes completely*). Higher scores represent higher levels of pain interference on daily function. This questionnaire has been validated across various populations (Cleeland & Ryan, 1994) and has been translated into multiple languages including French (Larue et al., 1991). The BPI is widely used in CP research, it has strong psychometric properties and is highly recommended as an outcome measure in studies on CP (Dworkin et al., 2005). This study obtained an internal consistency alpha coefficient equal to .89 for the Modified BPI.

Anxiety and Depressive Symptoms

The *Hospital Anxiety and Depression Scale* (HADS; Savard et al., 1998; Zigmond & Snaith, 1983) is a 14-item questionnaire that evaluates psychological distress in non-psychiatric settings, and it is frequently used for people with medical conditions as it excludes items associated to somatic symptoms that could be related (Hermann, 1997). This measure is comprised of two 7-item subscales which measure anxiety and depressive

symptoms. Items are scored on a 4-point Likert scale ranging from 0 to 3 with varying anchors, and higher scores reflect the presence of higher anxiety and depressive symptoms. Cut-off scores of ≥ 10 and ≥ 7 were established for the anxiety and depression subscales, respectively (Roberge et al., 2013). This questionnaire is frequently used in both research and clinical settings and has good psychometric properties in English and French (Savard et al., 1998; Zigmond & Snaith, 1983). The present study obtained an internal consistency alpha coefficient equal to .85 for the HADS items.

Quality of Life

The *World Health Organization Quality of Life Brief Scale* (WHOQOL-Bref; The WHOQOL Group, 1998) is a self-report measure comprised of 26 items which assess quality of life in terms of physical and psychological health, social relationships, environment, as well as two global items which measure overall satisfaction with life and general sense of personal well-being. Items are rated from 1 (*very poor*) to 5 (*very good*), with higher scores indicating better quality of life. It is possible to calculate four domain scores and multiply them by four to obtain scores comparable to the longer version of the questionnaire (WHOQOL-100) but in the present study, one general facet score reflecting overall quality of life and general health was calculated. This measure has good psychometric properties, namely good levels of internal consistency for its subscales ($\alpha = .66$ to $\alpha = .84$) and for the French version (Baumann et al., 2010), and adequate test-retest reliability ($r = .75$; The WHOQOL Group, 1998). The present study obtained an internal consistency alpha coefficient equal to .89.

Chronic Pain Self-Efficacy

The French-Canadian Chronic Pain Self-Efficacy Scale (FC-CPSES) is a 6-item scale measuring a person's confidence in the self-management of chronic pain (Lacasse et al., 2015). This questionnaire was translated and adapted from the *Chronic Disease and Self-Efficacy Scale* (Lorig et al., 1996). Items are rated on a Likert-type scale from 0 (*not at all confident*) to 10 (*entirely confident),* with higher scores indicating higher pain self-efficacy. The current study obtained an internal consistency alpha coefficient equal to .91.

Psychological Flexibility

The *Multidimensional Psychological Flexibility Inventory* (MPFI; Rolffs et al., 2016) is a 24-item scale derived from the original 60-item scale, and it measures psychological flexibility and inflexibility processes. Items are rated on a six-point Likert scale ranging from 1 (*never true*) to 6 (*always true*). This tool provides 12 distinct dimensions of flexibility or psychological inflexibility processes but an overall score of psychological flexibility was privileged in the current study. The MPFI-24 is a reliable measure with good internal consistency coefficients for both flexibility/inflexibility subscales ($\alpha = .77$ to $\alpha = .92$), and both in English and in French (Grégoire et al., 2020). The current study obtained an internal consistency alpha coefficient equal to .74.

Chronic Pain Acceptance

The *Chronic Pain Acceptance Questionnaire* (CPAQ-8; Fish et al., 2010; Scott et al., 2013) is self-report measure that evaluates acceptance of pain according to two sub-scales:

activity engagement, which reflects the degree to which individuals continue to engage in personally meaningful activities despite the presence of pain, and pain willingness, which reflects efforts directed at controlling pain. The original version of this questionnaire was comprised of 20 items and an 8-item short form (CPAQ-8) has since become available. The short version of the questionnaire was used in the current study. Items are rated on a Likert-type scale ranging from 0 (*never true*) to 6 (*always true*), and higher scores reflect greater acceptance of pain. The CPAQ has been commonly used in research. The short version has good psychometric properties and has been validated with an online sample (Fish et al., 2010). The present study obtained an internal consistency alpha coefficient equal to .70.

Weekly "Diary Items" Assessment

In addition to pretreatment, posttreatment, and three and six-month follow-up assessments, participants were asked to answer 7 items assessing the three main axis of the ACT psychological flexibility model ("open", "aware" and "active"; Hayes et al., 2011) as well as four outcome variables (pain-related disability, anxiety, depression, and quality of life). The four items assessing outcomes were inspired by validated measures but have not been directly validated in this short questionnaire. The three items assessing ACT processes have been used in previous research (Scott & McCracken, 2017) and were translated in French and the timeframe was slightly adjusted for the present study (see adapted version in French included in Appendix I). More specifically, the original English version of items refers to the last three days, whereas we modified the questions to refer

to the past seven days since measures were intended to be completed on a weekly basis. All items were rated on a Likert scale ranging from 0 (*never*) to 6 (*always)*. Furthermore, regarding the outcomes assessed in the weekly measure, pain intensity was not included because it is not a variable of particular interest to the ACT psychological flexibility model. However, since pain intensity was measured at pretreatment, posttreatment, and three and six-month follow-ups, it will be included in part of these analyses.

Data Analysis

Means and standard deviations along with frequency tables were used to describe participants' characteristics. To be included in the analyses, participants had to have completed 4/10 weekly measures. Growth mixture modeling (GMM) was used to conduct pain trajectory analyses. Up to eight pain trajectory models were tested using latent class mixed model (lcme) package (2022) in R version 4.1.2. Models varied in terms of number of groups, as well as inclusion of a linear only or linear and quadratic trends. Model selection was based on the Akaike Information Criterion (AIC) and Bayesian information criterion (BIC; lower values associated with better fit), entropy, interpretability of the model and a minimum of 5% of participants in each of the trajectories.

Once the model was selected, a categorical variable was created that represented trajectory membership (each participant was classified in the trajectory they had the highest probability of belonging to). This variable was used as the dependent variable in a nominal regression model to identify baseline predictors (group allocation (ACT online,

bibliotherapy, control), sex, age, education, pain intensity, pain interference, anxiety, depression, quality of life, pain self-efficacy, psychological flexibility and pain acceptance) of interference trajectory membership. Chi-square were used to examine how participants were classified across interference trajectories as a function of group allocation.

Results

Descriptive Statistics

The study's sample included a total of 297 who were randomized to one of the 3 treatment conditions (Internet-delivered: $n = 98$; bibliotherapy: $n = 98$; education: $n = 97$). The sample consisted of 90.4% women (N = 265), with an average age of 51 years ($SD = 11.53$). The majority of participants were White/Caucasian (95.5%, N = 277). Many participants had been living with chronic pain for 7 years or more (68.6%) and the most common type of chronic pain was fibromyalgia (40.6%, N = 119). Most participants (≥ 76%) were recruited from associations for people with CP in Quebec (Canada), and 191 individuals (65.2%) were recruited from one association (*Association Québécoise de Douleur Chronique*).

Randomisation was successful as participants in the three groups seemed comparable in terms of their sociodemographic and clinical characteristics (all $p \geq .01$), and primary and secondary outcome variables were also comparable at baseline (all $p \geq .01$). Participants in all three groups appeared to had moderate levels of pain-related disability,

mild symptoms of anxiety and depression, and moderate levels of quality of life prior to the intervention. Means and SD values for outcomes at pre, post, 3- and 6-month follow-ups are presented in Table 1. No differences were found between participants who completed follow-up measures and those who had at least one time point missing.

Self-reported adherence to treatment was comparable between groups, with participants from the Internet-delivered ACT group having completed on average 7.18/8 weeks (*SD* = 1.56), 6.82/8 weeks (*SD* = 1.46) for the bibliotherapy group, and 7.39/8 weeks (*SD* = 1.15) for the education control group. A total of 29 participants asked to discontinue their participation (Internet-delivered: *n* = 9; bibliotherapy: *n* = 8; education: *n* = 12). Reasons for discontinuation included major life events, lack of time, problems with Internet access and having previously seen similar content at a pain clinic. Attrition rates at post-test were 33.67% for the Internet-delivered ACT group, 28.57% for the ACT bibliotherapy group and 29.89% for the education control group. These rates increased at 3-month follow-up: 35.71% for the Internet-delivered ACT group, 36.73% for the ACT bibliotherapy group and 45.36% for the education control group. Finally, attrition rates at 6-month follow-up were much higher: 55.10% for the Internet-delivered ACT group, 50% for the ACT bibliotherapy group, and 51.54% for the education control group.

Table 1

Descriptive Statistics

Variable	Time	Web		Bibliotherapy		Education		Range
		M	*SD*	*M*	*SD*	*M*	*SD*	
Pain related disability (BPI)	Pre	52.30	16.35	58.58	18.07	57.77	18.32	0 to 100
	Post	43.98	20.83	42.51	21.60	52.08	23.32	
	3 months	45.39	21.84	42.78	24.66	53.32	23.54	
	6 months	44.02	21.47	43.36	25.67	44.14	23.14	
Anxiety (HADS-A)	Pre	8.41	3.66	8.86	3.00	8.64	3.09	0 to 21
	Post	7.95	3.91	7.10	3.46	8.02	3.29	
	3 months	7.51	3.71	7.42	3.36	7.92	3.34	
	6 months	7.65	4.02	7.83	3.57	7.98	3.34	
Depression (HADS-D)	Pre	9.12	4.07	9.44	3.93	9.51	3.55	0 to 21
	Post	7.90	4.05	7.45	3.97	8.70	4.21	
	3 months	7.73	4.07	8.19	3.54	8.79	4.58	
	6 months	7.72	4.71	8.28	4.16	7.87	3.80	
Quality of life (WHOQOL)	Pre	76.49	13.49	75.09	14.18	74.46	13.20	26 to 130
	Post	82.57	16.07	85.55	14.22	78.08	15.62	
	3 months	83.40	15.72	81.54	12.47	77.30	19.12	
	6 months	80.05	18.60	82.46	14.49	80.58	18.62	

Note. BPI: Pre: N = 277; Post: N = 182; 3 months: N = 162; 6 months: N = 131; HADS-A: Pre: N = 291; Post: N = 194; 3 months: N = 171; 6 months: N = 135; HADS-D: Pre: N = 291; Post: N = 195; 3 months: N = 171; 6 months: N = 135, WHOQOL: Pre: N = 233; Post: N = 152; 3 months: N = 140; 6 months: N = 116.

Pain Trajectories

Table 2 presents fit indices for all models tested. The final model retained, based on fitness indicators and theoretical soundness, was a four-trajectory model with linear trend only (AIC = 4477.8; BIC = 4518.3).

Table 2

Pain Trajectories Goodness of fit Indicators

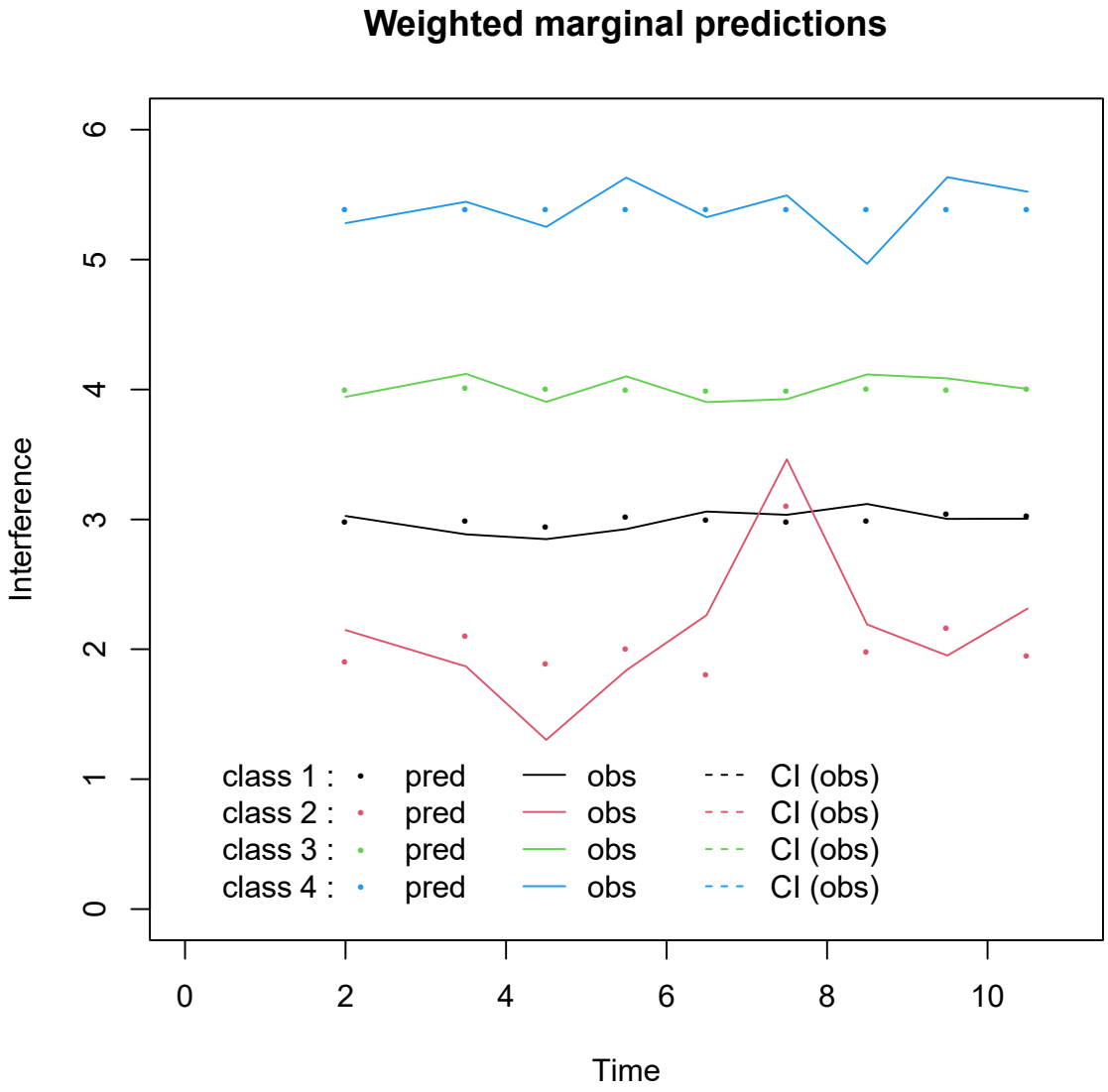
	Linear only		Linear + Quadratic	
Number of trajectories	AIC	BIC	AIC	BIC
1	5347.2	5357.4	5348.9	5362.5
2	4724.2	4744.5	4726.8	4753.9
3	4530.7	4561.1	4533.2	4573.8
4	**4477.8**	**4518.3**	4481.9	4536.0
5	4441.8	4492.5	4447.4	4515.0
6	4414.1	4474.9	4421.7	4502.8
7	4412.0	4482.9	4419.8	4514.5
8	4390.4	4471.5	4415.6	4523.8

Note. AIC: Akaike Information Criterion, BIC: Bayesian Information Criterion (lower values represent a better fit). Highlighted in **bold** are the coefficients for the model with the best fit.

These four pain interference trajectories are illustrated in Figure 1. Trajectory #1 ($n = 60$) showed moderate levels of pain interference and trajectory #2 ($n = 12$) showed lower levels of pain interference. Trajectory #3 ($n = 116$) showed high levels of pain interference and trajectory #4 ($n = 29$) showed very high pain interference. Trajectories #1 to #3 showed improvement with time ($p = .00$) although these changes may not be clinically significant. In contrast, trajectory #4 showed very high pain interference and was stable with time.

Figure 1

Results of Pain Trajectories Analysis Showed 4 Different Subgroups of Participants



Note. Trajectory #1 (n = 60), moderate levels of pain interference; trajectory #2 (n = 12), lower levels of pain interference; trajectory #3 (n = 116), high levels of pain interference; trajectory #4 (n = 29), very high pain interference and stable with time.

Baseline Predictors of Trajectory Membership

Results of the nominal regression analysis [$X^2(42, N = 217) = 139.11, p = .001$] showed that in addition to group allocation, there were 5 significant predictors of pain interference trajectory membership at baseline: pain interference, anxiety, quality of life, pain self-efficacy and psychological flexibility (see Table 3).

Compared to trajectory #4 (very high pain interference, stable with time), trajectory #1 (moderate levels of pain interference) had differences in pain interference ($p = .001$) and quality of life ($p = .049$) at baseline whereas trajectory #2 (lower levels of pain interference) had differences in pain interference ($p = .005$), quality of life ($p = .01$) and psychological flexibility ($p = .005$) at baseline.

Moreover, compared to trajectory #4 (very high pain interference, stable with time), trajectory #3 (high interference but some improvement with time) had differences in pain interference ($p = .001$), anxiety ($p = .01$) and pain self-efficacy ($p = .023$) at baseline.

Trajectory Groups Associated With Greater/Poorer Outcomes

Results from chi-square tests]$X^2(6, N = 217) = 18.10, p = .006$] revealed that participants in trajectory #2 (lower levels of pain interference) were more likely to be in the ACT bibliotherapy group [OR(95%CI) = 2.0] and participants in trajectory #4 (very high pain interference, stable with time) were more likely to be in the Web-based ACT group [OR(95%CI) = 2.3].

Table 3

Predictors of Pain Interference

Effect	Model Fitting Criteria	Chi-square	df	Sig.
Sex	310.60	6.97	3	.07
Age	304.63	1.00	3	.80
Education	311.91	8.28	6	.22
Group allocation	**319.85**	**16.23**	**6**	**.013***
Pain intensity	309.21	5.58	3	.13
Pain interference (BPI)	**326.34**	**22.71**	**3**	**.001***
Anxiety (HADS-A)	**313.82**	**10.20**	**3**	**.02***
Depression (HADS-D)	305.44	1.81	3	.61
Quality of life (WHOQOL)	**312.28**	**8.66**	**3**	**.03***
Self-efficacy (CPSES)	**311.53**	**7.90**	**3**	**.04***
Psychological flexibility (MPFI)	**312.42**	**8.79**	**3**	**.03***
Pain acceptance (CPAQ)	310.95	7.32	3	.06

Note. Variables that were statistically significant appear in **bold**.

Discussion

The present study sought to identify and describe various trajectories of change in pain-related disability during self-administered ACT interventions for chronic pain. As such, this study extends past research by aiming to better understand within-treatment change over the course of ACT self-help interventions for chronic pain. This aim appears to be consistent with recommendations from the *Association for Contextual Behavioral Science*'s Task Force (Hayes et al., 2021), namely, to include more idiographic and longitudinal-based research. Additionally, this study aimed to identify characteristics and baseline predictors of trajectory membership and to determine which trajectory groups

were associated with greater or poorer outcomes. So far, research on predictors of change in ACT interventions have shown inconsistent results (Gilpin et al., 2017; McCracken & Turk, 2002). Further research on this topic is warranted as the identification of reliable predictors could help tailor interventions and appropriately allocate resources.

This study's findings revealed four distinct trajectories of pain interference, three of which improved with time and one with very high interference which remained stable with time. These results suggest considerable variability in how individuals respond to self-help ACT interventions. While most participants showed improvements with time (n = 188), a subgroup of 29 individuals were in trajectory #4, which was characterized by high pain interference remaining stable with time. Results showed that individuals in this trajectory (#4) had higher baseline levels of pain interference, and lower baseline quality of life and psychological flexibility compared to individuals in trajectories #1 (moderate levels of pain interference) and #2 (lower levels of pain interference). Given this information, it may be possible that individuals in trajectory #4 may require greater therapeutic support before they can benefit from self-help. Previous research has indeed shown that greater clinician input can help improve outcomes (French et al., 2017; Gandy et al., 2022; Thompson et al., 2021).

Moreover, results showed that lower levels of baseline pain disability and anxiety, as well as higher baseline quality of life, psychological flexibility and pain self-efficacy were predictive of lower pain interference scores throughout the intervention. This suggests that

overall, participants who may benefit most from self-help interventions are likely to be participants who have greater physical/emotional functioning to begin with. This is important information to consider if self-help interventions continue to be recommended, and it may once again highlight the need for greater support for those with lower levels of physical/emotional functioning. Furthermore, results showed that the trajectory with the most favourable outcome (lower pain interference, improvement with time) was associated with the ACT bibliotherapy group, indicating that this modality might be particularly effective for individuals with lower levels of pain disability at baseline. Conversely, participants in the trajectory with very high pain interference and stable with time were more likely to be in the Web-based ACT group, suggesting this format may be less suitable for individuals with higher levels of pain disability at baseline. Taken together, these findings can be helpful as they underscore the importance of tailoring self-help interventions to individual patient characteristics. For example, based on our results, individuals with higher baseline levels of pain disability and anxiety, and lower quality of life, psychological flexibility and pain self-efficacy may require more intensive forms of treatment and greater therapeutic support before they are able to benefit from self-help formats. This aligns with previous research suggesting that higher initial levels of distress can impede the benefits of self-administered interventions (Trompetter et al., 2016).

Overall, results from this study have important clinical implications. Healthcare providers should consider these findings when recommending self-help ACT interventions for chronic pain. Results suggest that bibliotherapy might be more beneficial

for individuals with lower levels of pain disability, while those with higher disability might require additional support. This could involve a stepped-care approach where patients start with more guided interventions and gradually transition to self-help modalities as their condition improves. Additionally, the predictors of trajectory membership identified in the current study (i.e. baseline pain disability, anxiety, quality of life, psychological flexibility, and self-efficacy) can help clinicians identify which patients are most likely to benefit from specific self-help interventions. Incorporating these factors in the initial assessment could help enhance the personalization and effectiveness of treatment plans. It could be beneficial for future studies to further delineate (e.g., with the use of cut-off scores) the levels in which an individual may or may not benefit from self-help.

This study has several limitations that warrant consideration. First, the sample consisted of individuals who were self-selected and chose to participate in the study. These individuals may have been more motivated to engage with self-help materials than other individuals within the community, which may limit the generalizability of findings to broader chronic pain populations. Second, the study used self-reported measures, which introduces the possibility of bias. Additionally, the study used diary items which have not yet been validated. It would be important for future studies to replicate these results with validated measures. Third, our sample was predominantly composed of women with an average age of 51 years (SD = 11.53), which may limit the generalizability of our findings. Although demographic variables such as sex, age and education level did not appear to be

significant predictors of treatment outcomes in the current study, the sample composition may have influenced results. If future research aims to personalize interventions and better identify which interventions, under which conditions, work for whom, it would be important for future studies to take interest in self-help across different populations, genders and age groups. Future research could also explore the mechanisms underlying different trajectories of change in pain disability. Understanding processes that contribute to more favorable outcomes could help inform the development of more targeted interventions. Moreover, it would be beneficial to examine the long-term sustainability of improvements observed in the different trajectory groups.

In conclusion, the present study highlights the heterogeneity in responses to self-help ACT interventions for chronic pain by identifying four distinct trajectories of change in pain-related disability. These findings emphasize the need for more personalized approaches in recommending self-help interventions and suggest that bibliotherapy may be particularly helpful for individuals with lower levels of baseline pain disability. Clinicians should consider baseline characteristics such as pain disability, anxiety, quality of life, psychological flexibility, and self-efficacy when recommending these interventions. Future research should continue to investigate the mechanisms of change associated with different trajectories to optimize the use of self-help ACT interventions for chronic pain.

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Appendix I

Questionnaire hebdomadaire

Merci d'entourer le chiffre qui correspond le mieux à votre réponse.

Jamais	Très rarement	Rarement	Parfois	Souvent	Presque toujours	Toujours
0	1	2	3	4	5	6

Au cours des 7 derniers jours ...

1.	À quelle fréquence avez-vous été dérangé(e) par des sentiments d'anxiété?	0	1	2	3	4	5	6
2.	À quelle fréquence avez-vous été dérangé(e) par des sentiments de déprime?	0	1	2	3	4	5	6
3.	À quel point la douleur a-t-elle interféré avec vos activités quotidiennes?	0	1	2	3	4	5	6
4.	À quel point avez-vous été satisfait de votre qualité de vie?	0	1	2	3	4	5	6
5.	À quelle fréquence avez-vous été ouvert à accueillir vos pensées et sentiments plutôt que de chercher à lutter contre ceux-ci?	0	1	2	3	4	5	6
6.	À quelle fréquence avez-vous été conscient(e) et attentif/ve au moment présent plutôt que préoccupé par le passé ou le futur?	0	1	2	3	4	5	6
7.	À quelle fréquence votre comportement a-t-il été guidé par vos buts personnels et vos valeurs plutôt que par des pensées et sentiments que vous souhaitiez éviter?	0	1	2	3	4	5	6

Conclusion générale

La douleur chronique constitue un problème de santé majeur qui affecte la qualité de vie de millions de personnes à travers le monde. Même si l'allègement de la douleur est un droit fondamental humain (Cousins & Lynch, 2011), la gestion efficace de la douleur chronique demeure un défi considérable. Cette thèse doctorale avait deux objectifs principaux. Premièrement, elle avait pour but d'évaluer l'efficacité des interventions auto-administrées basées sur la thérapie d'acceptation et d'engagement (ACT) pour la douleur chronique en comparant deux formats différents (bibliothérapie et Web) à un groupe contrôle actif recevant de l'éducation sur la douleur. Deuxièmement, elle avait comme objectif d'examiner les différentes trajectoires de changement durant ces interventions et d'identifier des caractéristiques et prédicteurs des individus qui répondent bien ou moins bien à ces interventions.

Synthèse des principaux résultats

La première étude présentée dans le cadre de cette thèse a démontré que les interventions basées sur l'ACT, qu'elles soient livrées par l'entremise d'un livre ou d'une plateforme Web, pourraient être efficaces pour réduire l'incapacité reliée à la douleur, les symptômes de dépression et d'anxiété, et pour améliorer la qualité de vie des participants. Ces résultats sont cohérents avec ceux des recherches antérieures qui soulignent les bénéfices de l'ACT pour les personnes aux prises avec la douleur chronique (Velho et al., 2016). Cependant, il est important de noter que les tailles d'effet obtenues dans la présente

étude étaient petites, et plus petites en comparaison à certaines études antérieures sur les interventions auto-administrées ACT pour la douleur chronique. Par exemple, Rickardsson et al. (2021) ont comparé une intervention ACT en ligne à une condition liste d'attente et les résultats ont démontré des tailles d'effet élevées pour l'incapacité reliée à la douleur, des tailles d'effet moyennes pour les symptômes d'anxiété et de dépression des tailles d'effet faibles pour la qualité de vie. De plus, les résultats étaient maintenus au suivi d'un an. Une explication possible pour le contraste entre les tailles d'effet obtenues est que contrairement à plusieurs études antérieures, la présente étude a fait des comparaisons entre groupes avec un groupe contrôle actif et non une condition liste d'attente. Sur le plan méthodologique, ceci est plus rigoureux et permet de fournir des preuves plus solides quant à l'efficacité du traitement, mais ceci peut entrainer une réduction des tailles d'effets.

Dans la présente étude, aucune différence significative n'a été observée entre les deux formats d'intervention ACT en termes d'efficacité globale. Ceci est cohérent avec les résultats de recherches antérieures (French et al., 2017; Heapy et al., 2015) et suggère que les deux modalités peuvent être utiles et que le choix d'intervention peut être basé sur des préférences personnelles et les contraintes pratiques des individus. Toutefois, contrairement à ce qui était attendu, aucune différence n'a été observée entre les interventions ACT et le groupe contrôle actif recevant de l'éducation sur la douleur. Une explication possible est que les participants de notre échantillon avaient déjà des scores faibles d'anxiété et de dépression et des scores élevés de qualité de vie au pré-test (sous

les seuils cliniques), ce qui restreint la marge des gains thérapeutiques possibles. Il est intéressant aussi de noter que les résultats d'un essai clinique exploratoire comparant la thérapie de relaxation psychoéducative (TRP) à une combinaison de TRP suivie de l'ACT ont montré que les deux interventions étaient aussi efficaces pour la douleur chronique, et que l'ajout de l'ACT n'a pas significativement amélioré les résultats (Roslyakova et al., 2020). Ceci soulève la question de savoir si les gains thérapeutiques obtenus dans la présente étude sont réellement attribuables aux processus de l'ACT ou s'ils sont plutôt liés à des facteurs non-spécifiques (p. ex., la réception de courriels et d'appels téléphoniques, l'activation de participants à travers divers exercices, quelle que soit la modalité).

Nous pouvons également nous interroger sur la « dose » thérapeutique nécessaire aux changements. Rickardsson et al. (2021), qui ont obtenus des effets plus larges que les nôtres, ont utilisé une approche de « micro-apprentissages », où les participants recevaient du contenu ACT de manière progressive et continue. Cela contraste avec notre étude, où les participants ont eu accès à l'ensemble du contenu dès le départ, sauf pour le groupe contrôle. De plus, l'étude de Rickardsson et al. (2021) comprenait beaucoup plus de contact thérapeutique : pour chaque semaine du traitement, les psychologues passaient en moyenne 12,5 minutes par participant (*É-T* 7,5; étendue de 4 à 38 minutes) et ils envoyaient en moyenne 3,9 messages par participant (*É-T* 1,7; étendue de 1,5 à 8). Il serait pertinent pour les recherches futures de s'intéresser à l'intensité ou la « dose » nécessaire pour les interventions auto-administrées en plus d'examiner l'apport des processus de

l'ACT et des facteurs non-spécifiques dans les changements thérapeutiques (Rini et al., 2012).

Trajectoires de changement

En lien avec le deuxième objectif de cette thèse doctorale, l'analyse des trajectoires de changement a révélé quatre trajectoires distinctes au cours de l'intervention. Trois de ces trajectoires démontraient une amélioration avec le temps, alors que la quatrième trajectoire, caractérisée par des niveaux très élevés d'interférence reliée à la douleur, restait stable à travers le temps. Les résultats ont démontré que les individus appartenant à cette trajectoire rapportaient des scores plus élevés d'incapacité à la douleur et des scores plus faibles de flexibilité psychologique et de qualité de vie au pré-test comparé aux individus appartenant aux trajectoires avec des degrés faibles et modérés d'interférence. Compte tenu de cette information, il est possible que les individus appartenant à la quatrième trajectoire aient besoin d'un plus grand soutien thérapeutique ou d'une intervention alternative avant qu'ils puissent bénéficier des interventions auto-administrées. Les recherches antérieures ont effectivement démontré d'une plus grande implication du thérapeute peut améliorer les gains thérapeutiques (French et al., 2017; Gandy et al., 2022; Thompson et al., 2021).

Les résultats ont également montré que des degrés plus faibles d'incapacité liée à la douleur et d'anxiété au départ, ainsi qu'une meilleure qualité de vie, une plus grande flexibilité psychologique et un degré plus élevé d'efficacité personnelle à la douleur,

étaient prédictifs de scores plus faibles d'interférence de la douleur tout au long de l'intervention. Cela suggère que, dans l'ensemble, les individus qui pourraient le plus bénéficier des interventions auto-administrées sont ceux qui présentent un meilleur fonctionnement physique et émotionnel au départ. Cette information est importante à considérer si les interventions auto-administrées continuent à être recommandées car elle met en lumière le besoin potentiel d'un plus grand soutien pour les personnes ayant des niveaux de fonctionnement plus faibles. Étant donné que notre échantillon est issu de la communauté, il serait important pour les études futures de mener une étude similaire auprès d'une population clinique. En somme, ces résultats mettent en évidence la complexité de la douleur chronique et le besoin d'une approche thérapeutique nuancée et mieux adaptée aux besoins individuels.

Implications cliniques et pratiques

Les conclusions de cette thèse ont des implications importantes pour la pratique clinique. Les résultats suggèrent entre autres, que les professionnels de la santé devraient considérer les caractéristiques individuelles des patients avant de recommander des traitement auto-administrés basés sur l'ACT. Par exemple, les patients présentant des degrés élevés de flexibilité psychologique et un degré faible d'incapacité à la douleur peuvent bénéficier de la bibliothérapie, tandis que ceux avec un degré d'incapacité plus élevé pourraient avoir besoin d'un format d'intervention différent ou de soutien thérapeutique supplémentaire.

En outre, la facilité d'accès et l'aspect pratique des interventions auto-administrées peuvent aider à surmonter plusieurs barrières courantes dans l'accès aux traitements, telles que le coût financier, la distance géographique et les contraintes de temps. Cela pourrait potentiellement permettre à un plus grand nombre d'individus de bénéficier de traitements basés sur les données probantes, améliorant ainsi la qualité de vie des gens aux prises avec la douleur chronique.

Contributions à la littérature scientifique

Cette thèse contribue aussi à la littérature scientifique existante en apportant des éléments supplémentaires sur les interventions auto-administrées basées sur l'ACT pour la douleur chronique, bien que les résultats obtenus ne permettent pas de conclure de manière définitive quant à leur efficacité. La comparaison directe de deux formats différents (bibliothérapie et Web) en plus de l'inclusion d'un groupe contrôle actif étaient des forces importantes de la première étude et contribuent à enrichir la littérature scientifique dans le domaine. Cette thèse met également en lumière la variabilité des réponses aux traitements et l'importance d'identifier des prédicteurs de réponse aux interventions avec le deuxième article scientifique. Les résultats de la deuxième étude peuvent aider à guider les recherches futures en soulignant la nécessité d'aller vers des approches plus personnalisées et adaptées aux besoins individuels des patients.

Pistes de recherche futures

Bien que cette thèse constitue un apport important à la littérature scientifique existante, il nous reste encore beaucoup à mieux comprendre sur les interventions auto-administrées ACT pour la douleur chronique. Notamment, il serait intéressant pour les recherches futures de s'intéresser davantage aux mécanismes sous-jacents à ces interventions. Plus précisément, il serait pertinent pour les recherches futures de mieux déterminer si ce sont les processus spécifiques de l'ACT qui contribuent aux résultats thérapeutiques ou si ce sont plutôt les ingrédients non-spécifiques, ou une combinaison des deux. Les études futures pourraient nous éclairer davantage sur cette question.

De manière générale, il serait pertinent pour les études futures de tenter de mieux comprendre comment et pourquoi certaines interventions fonctionnent mieux pour certaines personnes, ce qui pourrait ensuite nous permettre de mieux adapter les interventions selon les besoins individuels. En outre, il est important de mentionner que la collecte de données pour cette thèse a été réalisée en 2018 et que depuis, il y a eu la pandémie de la COVID-19 et le développement rapide de la technologie dont l'intelligence artificielle. Il est possible que le degré de confort de la population face à l'utilisation de la technologie ait augmenté et des études plus récentes (p. ex., Gentili et al., 2021; Hauser-Ulrich et al., 2020) font utilisation de technologies plus avancées. Étant donné la rapidité des avancées technologiques, les études utilisant la technologie doivent suivre ce rythme.

Conclusion

En conclusion, cette thèse a démontré que les interventions basées sur l'ACT, lorsqu'elles sont auto-administrées, pourraient offrir des avenues intéressantes dans le traitement de la douleur chronique, bien que des recherches supplémentaires soient nécessaires pour en confirmer leur efficacité. Les résultats de notre étude suggèrent, entre autres, que les individus allant moins bien au départ pourraient probablement mieux bénéficier d'autres interventions ou d'un plus grand soutien thérapeutique avant de bénéficier des interventions auto-administrées. Une approche par étapes (*stepped-care*) pourrait être favorisée pour ces personnes. Les recherches futures devraient continuer à explorer les mécanismes de changement de ces interventions, tout en s'intéressant aux variations individuelles au cours de ces interventions. Les contributions de cette thèse ouvrent la voie à des approches thérapeutiques innovantes, accessibles et efficaces pour la gestion de la douleur chronique et par conséquent, contribuent à améliorer la qualité de vie des personnes affectées par cette condition de santé.

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