UNIVERSITÉ DU QUÉBEC À MONTRÉAL

LA TECHNOTHÈQUE : SOUTENIR L’INNOVATION EN RÉADAPTATION PÉDIATRIQUE

MÉMOIRE

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PAR

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AVANT-PROPOS

Dans ce texte, l'usage du féminin pour nommer les participant·es cliniciennes et cliniciens vise à alléger la lecture et reflète la forte représentation des femmes dans les professions de la réadaptation pédiatrique. Cette convention inclut néanmoins les formes masculines et non binaires. Cette orientation éditoriale a été adoptée sans aucune intention discriminatoire et avec une profonde appréciation pour la diversité des identités et des appartenances individuelles.

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ADOPT-VR2 = *Assessing Determinants of Prospective Take Up of Virtual Reality* (version 2)

AR = Augmented reality (Français: Réalité augmentée)

CFIR = *Consolidated Framework for Implementation Research*

MR = Mixed reality (Français: Réalité mixte)

PC = Personal computer (Français: ordinateur personnel)

RV/VR = Réalité virtuelle/Virtual reality

XR = xReality (Français: Réalité « x »)

RÉSUMÉ

En réadaptation pédiatrique, différentes technologies interactives incluant la réalité virtuelle ou les jeux vidéo actifs (regroupées sous le terme « XR ») peuvent améliorer les fonctions ou le bien-être des jeunes en situation de handicap. Cependant leur intégration en pratique clinique demeure limitée par des enjeux d'accès, d'infrastructures et de manque de connaissances.

Pour répondre à ces besoins, nous avons développé la *Technothèque* au Centre de réadaptation Marie Enfant du CHU Sainte-Justine, un espace de $50m^2$ offrant plus de 150 jeux de XR et soutenu par une équipe de courtières de connaissances. Cette étude visait à évaluer la faisabilité de la *Technothèque* selon trois critères proposés par Bowen et al. (2009) – la demande, l'acceptabilité et l'implantation – et identifier les facteurs l'influençant. Fondée sur un devis mixte convergent, l'étude était ouverte à toutes les cliniciennes intéressées pendant quatre mois. Les mesures comprenaient : statistiques d'utilisation, satisfaction auto-rapportée, scores pré-post du questionnaire *Assessing Determinants of Prospective Take-up of Virtual Reality* (version 2; ADOPT-VR2), et des entretiens individuels semi-structurés. Les résultats ont été intégrés selon une approche d'expansion, mobilisant les thèmes qualitatifs pour éclairer les données quantitatives.

Les principaux résultats indiquent que la demande pour la *Technothèque* variait selon la clientèle suivie et selon les perceptions des cliniciennes quant aux clientèles jugées appropriées pour la XR. Les cliniciennes travaillant auprès de jeunes hospitalisés ont été les utilisatrices les plus fréquentes, en raison d'un besoin accru de diversifier les activités thérapeutiques et de conditions favorables à l'appropriation des outils. La satisfaction des cliniciennes était élevée, particulièrement grâce au soutien des courtières de connaissances qui facilitaient l'intégration clinique de la XR. La diversité des systèmes de XR offrait une grande flexibilité, mais impliquait également une courbe d'apprentissage importante. Une implantation prolongée serait nécessaire pour accroître la visibilité du service et favoriser son intégration dans les routines cliniques. En conclusion, la *Technothèque* représente un modèle faisable pour soutenir l'adoption de la XR en réadaptation pédiatrique. Cependant, les importantes ressources mobilisées pour son implantation (p. ex. équipement, espace, employés rémunérés) limitent sa reproductibilité à grande échelle. À la lumière de ces résultats, nous proposons d'adapter et développer le modèle sur d'autres sites cliniques.

Mots clés : Réadaptation, pédiatrie, réalité virtuelle, XR, études de faisabilité, études mixtes

INTRODUCTION GÉNÉRALE

La réadaptation pédiatrique vise à soutenir les enfants présentant des handicaps acquis ou congénitaux dans l'atteinte de leur plein potentiel physique, cognitif, social et éducatif (Hsu *et al.*, 2021). Depuis presque trente ans, les technologies interactives, notamment les jeux vidéo actifs ou la réalité virtuelle, suscitent un intérêt croissant en réadaptation (Keshner *et al.*, 2019). Leur utilisation a démontré des effets positifs sur les fonctions motrices (Iosa *et al.*, 2022 ; Polizzi *et al.*, 2023), cognitives (Newbutt *et al.*, 2020 ; Pellas *et al.*, 2021) et sur la participation sociale (Redepenning *et al.*, 2023). Malgré ces résultats, leur intégration clinique demeure limitée tant au Canada (Levac *et al.*, 2017) qu'à l'international (Alrashidi *et al.*, 2024 ; Cho *et al.*, 2024 ; Levac *et al.*, 2020).

Depuis 2022, je contribue au développement de la *Technothèque*, l'initiative de recherche-clinique conçue pour répondre à ces enjeux. Ce mémoire présente d'abord le contexte théorique recensant les principaux facteurs qui influencent l'implantation des technologies interactives en réadaptation pédiatrique. Il comprend ensuite deux articles tirés du projet de recherche réalisé dans le cadre de ma maîtrise en Sciences de l'activité physique à l'Université du Québec à Montréal. Le premier retrace le développement de la *Technothèque*, ses fondements en science de l'implantation et le protocole de l'étude. Le second présente les résultats de l'étude mixte de faisabilité qui est au cœur de mes travaux de recherche.

La terminologie entourant ces technologies évoluant rapidement, le premier article de ce mémoire utilise d'abord le terme « réalité virtuelle » (RV) selon la définition unifiée de Kardong-Edgren (2019). Dans le deuxième article, nous adoptons la terminologie plus récente proposée par Rauschnabel et al. (2022), soit la réalité « x » (XR), employé comme terme général pour décrire l'ensemble des technologies digitales. Cette approche permet de s'éloigner de la question de l'efficacité de dispositifs précis pour s'intéresser plutôt aux mécanismes transversaux influençant leur intégration clinique.

Bien que la *Technothèque* soit implantée dans un centre spécifique, les résultats présentés dans ce mémoire offrent des connaissances transférables à d'autres milieux de réadaptation, indépendamment des outils technologiques dont ils disposent. Au final, cette étude pourrait contribuer à une intégration pérenne d'outils modernes, engageants et fondés sur les données probantes, au bénéfice des jeunes suivis en réadaptation pédiatrique.

CHAPITRE 1

Contexte théorique

1.1 Introduction du chapitre

Ce chapitre présente le cadre théorique qui a guidé le développement de mon projet de recherche. Les premières sections définissent les technologies de réalité « x » (XR) utilisées en réadaptation pédiatrique et décrivent leurs applications cliniques en réadaptation motrice, cognitive et psychosociale. Le chapitre résume ensuite les principaux défis liés à l'intégration de la XR en réadaptation, regroupés sous trois grandes thématiques : la difficulté à rapidement générer des preuves scientifiques favorisant l'acceptation clinique, l'incompatibilité de certaines technologies avec les milieux de soin et le manque de connaissances des cliniciennes. Les stratégies proposées dans la littérature scientifique pour répondre à ces obstacles sont ensuite présentées, incluant l'évaluation du contexte clinique, la création de ressources éducatives, de l'accès à un soutien ainsi que diverses activités de formations et de développement des compétences cliniques. Ce chapitre se conclut par un survol des cadres conceptuels et des méthodes d'évaluation recommandées pour concevoir et évaluer les études d'implantation de la XR en réadaptation pédiatrique.

1.2 Réalité « x » en réadaptation pédiatrique

La réalité virtuelle (RV) peut être définie comme un environnement virtuel généré par un ordinateur, perçu à travers des stimuli sensoriels (p.ex. des images et des sons) et dans lequel les actions de l'utilisateur influencent partiellement ce qui s'y produit (Kardong-Edgren *et al.*, 2019). Cette définition, est largement utilisée en contexte de santé (Rose *et al.*, 2005 ; Shin et Kim, 2015) car elle permet l'inclusion des systèmes de jeux vidéo traditionnels ainsi que d'autres technologies de pointe qui sont utilisées en pratique clinique, à condition que l'utilisateur puisse interagir avec ces technologies par rétroaction sensorielle et/ou motrice (Shen *et al.*, 2020). Cependant, le terme réalité « x » (XR) a récemment été suggéré par Rauschnabel et al. (2022) pour répondre à un besoin d'unifier la terminologie employée par l'industrie des technologies et la littérature scientifique lorsque différents types de dispositifs sont décrits. De récentes publications en réadaptation adoptent désormais ce terme pour représenter l'ensemble des technologies numériques qui sont pertinentes au domaine (Hess *et al.*, 2025 ; Lim *et al.*, 2025 ; Ramos *et al.*, 2025). Ce mémoire reflète cette transition terminologique : le terme « RV » était utilisé dans l'article de protocole rédigé il y a un an, puis notre équipe s'est alignée sur les avancées du domaine en adoptant « XR ». Ainsi le terme XR sera employé dans la mise en contexte et la présentation des résultats pour désigner toutes les technologies qui génèrent ou modifient une réalité digitale, incluant la réalité virtuelle immersive, nonimmersive ou semi-immersive, la réalité augmentée, les applications mobiles, les jeux vidéo actifs ou conventionnels, ou encore l'ordinateur personnel (PC). Ce choix terminologique reflète l'objectif du mémoire, qui porte sur l'intégration de différentes technologies interactives en réadaptation pédiatrique, plutôt que sur l'efficacité d'un dispositif spécifique. Les sections suivantes présenteront les principaux types de technologies XR ainsi que leurs applications dans divers domaines de la réadaptation pédiatrique.

1.2.1 Systèmes de XR commerciaux et sur mesure

Tant les systèmes commerciaux (conçus pour le grand public) que les systèmes sur mesure (développés à des fins de réadaptation) ont été utilisés en réadaptation pédiatrique (Burdea, 2003 ; Deutsch et McCoy, 2017 ; Levac *et al.*, 2017), chacun présentant des forces et des limites propres selon leur contexte d'application. Les systèmes commerciaux se distinguent par leur accessibilité, leur coût abordable et leur large éventail d'options susceptibles de maintenir l'intérêt des jeunes au cours des thérapies (Deutsch et McCoy, 2017 ; Galvin et Levac, 2011 ; Levac *et al.*, 2017). Par la variété de la sélection disponible, ils permettent également de personnaliser le choix des jeux en fonction des préférences de chaque patient (Charles *et al.*, 2020). Bien qu'ils soient avant tout conçus pour le divertissement, certaines fonctionnalités de détection de mouvement s'alignent parfois naturellement avec les besoins de la rééducation motrice (Bonnechère *et al.*, 2016 ; Deutsch et McCoy, 2017). Par exemple, le jeu « *Ring Fit Adventure* » sur la console Nintendo Switch, grâce à sa sangle de cuisse munie d'un capteur inertiel, peut permettre à un enfant atteint d'hémiparésie de pratiquer l'appui unilatéral en marchant sur place à travers des mondes virtuels immersifs (Ferron *et al.*, 2023b). Toutefois, les systèmes commerciaux offrent peu d'options pour s'adapter aux capacités fonctionnelles variées de la clientèle en réadaptation pédiatrique (Deutsch et McCoy, 2017 ; Levac et Miller, 2013 ; Proffitt *et al.*, 2019). À titre d'exemple, les manettes de jeux vidéo nécessitent souvent une coordination bimanuelle et une dextérité fine élevées, des habiletés fréquemment altérées chez les enfants atteints de paralysie cérébrale, le trouble neurologique le plus fréquent en pédiatrie (Oskoui *et al.*, 2013). À l'inverse, les systèmes sur mesure sont généralement conçus par une équipe multidisciplinaire afin de créer des outils adaptés aux besoins spécifiques des patients (Charles *et al.*, 2020). Ces technologies visent directement l'amélioration de fonctions altérées et permettent souvent de moduler la difficulté des tâches selon la progression de l'enfant (Chen *et al.*, 2014 ; Demers *et al.*, 2021 ; Iruthayarajah *et al.*, 2017 ; Vieira *et al.*, 2021). Par exemple, le REAtouch est un système sur mesure muni d'un écran tactile monté sur une structure ajustable, qui favorise les interactions avec de vrais objets au moyen de jeux encourageant la pratique répétée de tâches bimanuelles (Saussez *et al.*, 2023). Malgré leurs avantages, plusieurs défis freinent l'utilisation clinique de ces systèmes sur mesure, notamment le manque de ressources pour concevoir des logiciels et équipements de qualité (Charles *et al.*, 2020, p. 202 ; Demers *et al.*, 2021), ainsi que des contraintes organisationnelles et financières limitant la diffusion des produits finaux dans la pratique clinique (Deutsch et McCoy, 2017). Néanmoins, la recherche portant sur l'utilisation clinique des technologies de XR, qu'elles soient commerciales ou sur mesure, a démontré des bénéfices dans plusieurs sphères de la réadaptation pédiatrique.

1.2.2 Application de la XR en réadaptation motrice, cognitive et psychosociale

En réadaptation motrice, la XR suscite un grand intérêt par sa capacité à mobiliser des principes clés de l'apprentissage moteur, tels que la répétition, la progression de la difficulté des tâches et la motivation du patient (Demers *et al.*, 2021 ; Deutsch et McCoy, 2017 ; Zanatta *et al.*, 2022). Les jeux de RV offrent des rétroactions multimodales et des paramètres ajustables (p. ex. vitesse, amplitude de mouvement), favorisant une pratique adaptée et stimulante (Adamovich *et al.*, 2009 ; Parsons *et al.*, 2009 ; Rizzo et Kim, 2005). En recherche pédiatrique, la XR est principalement utilisée pour traiter les troubles neuromoteurs, notamment chez les enfants atteints de paralysie cérébrale (Massetti *et al.*, 2018 ; Polizzi *et al.*, 2023 ; Voinescu *et al.*, 2021). Les interventions en XR ont démontré des bénéfices pour améliorer le contrôle postural en position debout et les transferts de poids (Lim *et al.*, 2025 ; Liu *et al.*, 2022 ; Tobaiqi *et al.*, 2023 ; Varma *et al.*, 2022 ; Wang *et al.*, 2023), ainsi que la fonction des membres supérieurs et des mains (Johansen *et al.*, 2019 ; Novak *et al.*, 2020 ; Tobaiqi *et al.*, 2023 ; Varma *et al.*, 2022). De plus, certaines études menées auprès d'enfants ayant subi un traumatisme craniocérébral ont rapporté une amélioration de l'équilibre dynamique et une augmentation de la motivation à participer aux thérapies (Palma *et al.*, 2011 ; Tatla *et al.*, 2014). L'*exergaming*, défini comme l'utilisation de jeux vidéo favorisant l'activité physique (Barry *et al.*, 2014), constitue une autre approche utilisée pour améliorer la condition physique d'enfants présentant des troubles tels que le trouble du spectre de l'autisme ou le spina-bifida (Deutsch et McCoy, 2017 ; Lee et Jin, 2024). L'*exergaming* a également été implanté à domicile auprès de jeunes ayant des enjeux de mobilité (Demers *et al.*, 2020 ; Wang et Reid, 2011), ou encore pour prévenir le déclin fonctionnel lors d'hospitalisations (Basha *et al.*, 2022 ; Bonnechère *et al.*, 2014).

En réadaptation cognitive, la réalité virtuelle immersive est utilisée comme outil d'évaluation et d'intervention visant l'amélioration de différentes habiletés. Certaines applications ont été conçues pour évaluer des fonctions cognitives spécifiques dans des contextes écologiques. Par exemple, il est possible de mesurer la vitesse de traitement de l'information et la qualité de l'attention lors de tâches continues en intégrant des éléments de distraction dans un environnement virtuel de salle de classe (Díaz-Orueta *et al.*, 2014 ; Wiebe *et al.*, 2022). Ces outils sont particulièrement employés pour caractériser le profil attentionnel de jeunes présentant un trouble du déficit de l'attention avec ou sans hyperactivité (TDAH) (Riva *et al.*, 2019 ; Wiebe *et al.*, 2022), un trouble du spectre de l'autisme (Riva *et al.*, 2019), ou encore pour évaluer les effets d'un traumatisme craniocérébral (Gilboa *et al.*, 2015). En recherche clinique, certaines applications ont été développées pour améliorer la mémoire de travail chez les enfants ayant survécu à un cancer (Cox *et al.*, 2015) ou pour favoriser la consolidation de la mémoire chez les jeunes atteints de TDAH (Baumann *et al.*, 2020). Enfin, la combinaison d'interventions traditionnelles et de séances de XR s'est révélée efficace pour soutenir le développement cognitif d'enfants présentant un trouble du spectre de l'autisme (Zhao *et al.*, 2022).

La réadaptation psychosociale englobe plusieurs aspects du bien-être cognitif, émotionnel et social (Husain, 2022). Ce type de soutien clinique peut viser aussi bien les enfants et adolescents en bonne santé physique que ceux vivant avec une maladie chronique : ces derniers sont toutefois souvent plus vulnérables aux troubles de santé mentale et aux difficultés relationnelles que leurs pairs au développement typique (Downs *et al.*, 2018 ; Nijhof *et al.*, 2018). Certaines applications de réalité virtuelle immersive ont été conçues pour recréer des situations fictives dans un cadre expérimental, démontrant des améliorations significatives des symptômes dépressifs chez les adolescents (Merry *et al.*, 2012) ainsi qu'une réduction des symptômes anxieux chez les enfants présentant un trouble anxieux (Tsui *et al.*, 2021). D'autres applications ont été utilisées pour entraîner les habiletés sociales (Yuan et Ip, 2018 ; Zhao *et al.*, 2022), la reconnaissance des émotions (Frolli *et al.*, 2022) ou encore la communication non verbale (Cai *et al.*, 2013) chez les jeunes ayant un trouble du spectre de l'autisme. Au-delà des applications spécifiquement destinées à l'amélioration des compétences ou des symptômes, la XR peut exploiter les qualités ludiques du jeu pour créer des défis motivants et ainsi offrir un environnement propice à l'apprentissage de la régulation émotionnelle (Granic *et al.*, 2014 ; Nijhof *et al.*, 2018). Chez les enfants présentant des limitations physiques, les jeux vidéo peuvent également servir de moyen pour atteindre des étapes clés du développement social, en contournant les obstacles liés au jeu physique (Nijhof *et al.*, 2018). Certaines études se sont même intéressées aux aspects prosociaux du jeu vidéo, en mettant en place des activités de groupe virtuelles visant à favoriser les interactions entre jeunes à mobilité réduite, leur permettant de participer confortablement depuis leur domicile (Lai *et al.*, 2023 ; Lee et Jin, 2024). En milieu hospitalier, les interventions basées sur le jeu peuvent contribuer à réduire le stress et à préparer les enfants à des traitements invasifs ou désagréables (Li *et al.*, 2016 ; Norris *et al.*, 2012 ; Zahr, 1998). Par exemple, une étude récente a utilisé la XR pour la réadaptation de deux adolescents en soins intensifs à la suite d'accidents graves (Lai *et al.*, 2021). Après deux séances, les cliniciens ont observé une amélioration notable des interactions, facilitant la communication et la collaboration lors des séances de physiothérapie, soulignant ainsi le potentiel de la XR pour atténuer l'anxiété, la douleur et les symptômes dépressifs.

1.3 Défis et barrières à l'intégrations de la XR en réadaptation

Malgré les perspectives prometteuses mises en évidence dans divers domaines de la réadaptation, la XR demeure peu utilisée en pratique clinique. En 2017, une enquête menée par Levac et al. a examiné l'utilisation de la XR par les ergothérapeutes et physiothérapeutes à travers le Canada. À première vue, les résultats sont surprenants : bien que la majorité des cliniciennes (76 %) expriment un intérêt à en apprendre davantage et que près de la moitié (46 %) aient déjà utilisé la XR dans leur pratique, peu l'intègrent de manière régulière. En réalité, 74 % des cliniciennes ayant déjà expérimenté la XR ne l'utilisent qu'une fois par mois ou moins. Pour mieux comprendre ce paradoxe, plusieurs études se sont penchées sur les freins à l'adoption de la XR en contexte clinique. Les sections suivantes mettent en lumière les défis liés à la production et à la diffusion des données probantes nécessaires à une intégration à grande échelle de la XR dans les systèmes de santé.

1.3.1 Données probantes et acceptation clinique

Un des principaux défis de l'intégration de la XR en réadaptation réside dans son acceptation par les professionnels et les décideurs du milieu de la santé. Pour qu'une nouveauté soit acceptée cliniquement, elle doit être basée sur des données probantes ainsi que sur la proactivité des acteurs du milieu à l'intégrer dans la pratique (Burdea, 2003). En 2023, une étude de la portée révèle que de nombreuses cliniciennes perçoivent négativement la qualité ou la quantité de preuves scientifiques concernant l'efficacité des interventions de XR (Kouijzer *et al.*, 2023). Cette méfiance peut s'expliquer en partie par le caractère novateur des différents systèmes de XR. En général, il est recommandé de valider la faisabilité ou l'efficacité des interventions émergentes par des études à petit échantillon, avant d'en étendre l'application sur le terrain (Shen *et al.*, 2020). Ainsi, les critiques des études sur la XR déplorent des résultats hétérogènes et de faible qualité, tant en ce qui concerne les types de populations qui bénéficient d'intervention utilisant la XR, que la nature des systèmes qui devraient être utilisés (Kim *et al.*, 2020).

L'évolution rapide des technologies est un autre enjeu d'importance, puisqu'il surpasse constamment le rythme de la production scientifique (Demers *et al.*, 2020 ; Galvin et Levac, 2011). Par exemple, une étude portant sur l'efficacité clinique d'une plateforme virtuelle peut être publiée alors que cette technologie a déjà été retirée du marché ou remplacée par une version améliorée, rendant l'ancienne obsolète ou inaccessible. Devant ce roulement continu, il devient compliqué d'établir un consensus clinique durable, ce qui limite les opportunités de financement pour l'implantation de programmes d'intervention à plus grande échelle (Alt Murphy *et al.*, 2023 ; Burdea, 2003 ; Kouijzer *et al.*, 2023 ; Shen *et al.*, 2020). À ce sujet, Kouijzer et al. soulignent ce paradoxe intéressant:

> Healthcare organizations and healthcare providers would like to have evidence of the added value of VR before investing in the technology for its implementation, but the efficacy of VR in practice can only be determined in an ecologically valid way when it is already thoroughly implemented in healthcare practice. (Kouijzer, 2023, p.15)

1.3.2 Compatibilité avec le milieu de la santé et ses acteurs

Pour être bien intégrée à la pratique, une technologie doit être en adéquation avec l'environnement physique, les pratiques courantes des cliniciennes, et avec la culture organisationnelle d'une institution (Alt Murphy *et al.*, 2023 ; Kouijzer *et al.*, 2023). Cependant, plusieurs défis importants freinent encore l'utilisation efficace de la XR au sein des établissements de santé. Parmi ceux-ci figurent notamment un réseau Wi-Fi insuffisant ou des pare-feux restrictifs (Bier *et al.*, 2018 ; Kouijzer *et al.*, 2023), ainsi qu'un manque de soutien technique pour l'entretien et la mise à jour des équipements : ce fardeau retombe donc sur les cliniciennes, qui manquent souvent de compétences techniques ou de temps pour s'en charger (Cho *et al.*, 2024 ; Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2017).

Les attitudes, valeurs et perceptions des acteurs d'une organisation influencent également le succès de l'intégration de la XR en réadaptation. En effet, de nombreux auteurs soulignent que pour arriver à une intégration durable, les avantages perçus par les professionnelles doivent l'emporter sur l'effort requis pour son utilisation (Louie *et al.*, 2022 ; Zanatta *et al.*, 2022). Ainsi, l'attitude initiale des cliniciennes envers l'utilisation de la XR serait un prédicteur déterminant de son adoption clinique (Levac *et al.*, 2017), puisque les perceptions (p.ex. la facilité d'utilisation, la pertinence clinique) peuvent influencer le succès des stratégies d'implantation (Glegg *et al.*, 2013). Le soutien des décideurs organisationnels est également essentiel afin de garantir l'accès aux espaces de traitement et au temps nécessaire à la formation (Kouijzer *et al.*, 2023), deux éléments qui figurent parmi les obstacles les plus fréquemment rapportés par les professionnelles de la réadaptation (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2017).

1.3.3 Manque de connaissances des cliniciennes

Les cliniciennes estiment avoir besoin de renforcer leurs connaissances dans plusieurs domaines avant de pouvoir utiliser la XR en pratique (Alrashidi *et al.*, 2024 ; Cho *et al.*, 2024 ; Glegg *et al.*, 2013 ; Levac *et al.*, 2017). En particulier, les professionnelles rapportent de faibles compétences techniques pour opérer l'équipement, peu de familiarisation avec l'inventaire des technologies disponibles, et un manque de connaissances pour choisir les modalités de XR les mieux adaptées à leurs objectifs cliniques (Glegg *et al.*, 2013 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2017). Une revue de la portée publiée en 2024 et incluant 25 études montre que les cliniciennes considèrent les technologies de XR comme une modalité innovante et motivante pour leurs patients, mais soulignent également la courbe d'apprentissage abrupte qui entraîne une augmentation importante de leur charge de travail (Alt Murphy *et al.*, 2023). Dans un contexte où peu de ressources existent pour orienter l'utilisation quotidienne de la XR en réadaptation, les cliniciennes se retrouvent dans une situation complexe : suivre le développement des technologies et s'autoformer, sans bénéficier de temps alloué dans leur horaire pour cet apprentissage (Galvin et Levac, 2011).

1.4 Stratégies d'implantation à l'intégration de la RV en réadaptation

Les défis complexes et multisectoriels liés à l'intégration des technologies de XR au sein des établissements de santé exigent des solutions diversifiées et adaptées au contexte. Bien qu'une grande partie de la recherche se soit concentrée sur l'identification des obstacles à l'intégration (Kouijzer *et al.*, 2023), la littérature scientifique propose également plusieurs stratégies, offrant ainsi des pistes concrètes pour faire progresser leur adoption. Les stratégies d'implantation sont définies comme « les actions concrètes qui sont entreprises pour amener les professionnels de la santé à adopter et maintenir l'utilisation de nouvelles données probantes en milieu clinique » [Notre traduction] (Waltz *et al.*, 2015). Elles peuvent être appliquées de manière isolée ou combinée, selon les barrières spécifiques au contexte (Powell *et al.*, 2019). Cette section présente une synthèse des stratégies suggérées ou mise en action pour faciliter l'adoption de la XR en pratique clinique.

1.4.1 Évaluation du contexte d'implantation

Après une analyse approfondie de quatre études de cas sur l'intégration de la XR, Proffit et al. (2019) concluent que même les meilleures initiatives de transfert des connaissances n'entraînent pas une hausse de l'utilisation si les barrières environnementales ne sont pas prises en compte. Ces résultats appuient l'importance d'une évaluation multifactorielle. Par exemple, des éléments contextuels liés à la structure organisationnelle (p.ex. horaire, disponibilité des locaux), au financement et à l'accessibilité des ressources peuvent tous promouvoir ou nuire aux activités d'implantation (Glegg *et al.*, 2017a ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2016). Ces informations détaillées permettent de rapidement cibler les obstacles les plus importants et de mobiliser efficacement les facilitateurs en place (Glegg et Levac, 2018). À cette étape, la consultation des cliniciennes est particulièrement importante pour déterminer des stratégies d'implantation : une bonne compréhension du raisonnement clinique des professionnelles permettra de cibler l'acquisition de technologies de XR qui s'arriment au rôle clinique, et qui répondent aux besoins des patients (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018 ; Laver *et al.*, 2017). L'exclusion des cliniciennes dans cette phase exploratoire risque de créer un décalage entre leurs besoins et les stratégies d'implantation proposées (Levac *et al.*, 2016).

1.4.2 Développement de ressources éducatives

Le développement de ressources éducatives soutenant l'utilisation clinique de la XR est une avenue fréquemment conseillée pour remédier au manque de connaissances des cliniciennes en réadaptation (Alt Murphy *et al.*, 2023 ; Cho *et al.*, 2024 ; Kouijzer *et al.*, 2023). Certaines équipes de recherche ont développé un cadre de classification pour décrire l'utilité clinique des jeux de XR et ainsi faciliter la prise de décision des cliniciennes (Deutsch *et al.*, 2011 ; Espy *et al.*, 2021a ; Galvin et Levac, 2011 ; Givon Schaham *et al.*, 2018 ; Levac *et al.*, 2015). Certaines ressources plus traditionnelles, comme un manuel clinique (Glegg *et al.*, 2013) ou des modules d'apprentissage en ligne (Levac *et al.*, 2016), sont développées pour être combinées à de la formation pratique. Enfin, des initiatives multidisciplinaires modernes ont également été établies pour orienter le choix des modalités de XR à l'aide outils virtuels (Bermúdez i Badia *et al.*, 2016 ; Levac *et al.*, 2015). Bien que ce type d'outil puisse renforcer la confiance et les connaissances des cliniciennes souhaitant utiliser la XR (Glegg *et al.*, 2017a), l'évolution rapide des technologies demeure un obstacle à la mise à jour nécessaire pour garantir leur utilité.

1.4.3 Accès et support technique

L'accès aux ressources humaines et matérielles figure parmi les facilitateurs les plus souvent mentionnés par les cliniciennes pour favoriser l'adoption de la XR (Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2017). L'ouverture d'une salle dédiée à la XR au sein d'un centre de réadaptation peut être une solution intéressante pour promouvoir et soutenir l'accès à ces technologies (Ferron *et al.*, 2023a ; Nguyen *et al.*, 2019). Cependant, avoir accès à l'équipement sans bénéficier d'un soutien technique risque d'alourdir la charge des cliniciennes dont l'horaire chargé laisse peu de temps pour allumer les consoles, régler les problèmes techniques ou ajuster les accessoires en fonction des besoins de l'enfant (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018 ; Gustavsson *et al.*, 2022). Ainsi, une étude de la portée parue en 2023 et incluant 29 études indique qu'une stratégie d'implantation optimale consisterait à accorder du temps aux cliniciennes pour explorer différentes technologies de XR et leur fournir un soutien technique pendant leur utilisation clinique (Kouijzer *et al.*, 2023).

1.4.4 Activités de formation

Il est essentiel de former les cliniciennes afin qu'elles acquièrent les compétences nécessaires pour intégrer leur raisonnement clinique à l'utilisation de la XR en contexte thérapeutique (Deutsch et McCoy, 2017 ; Galvin et Levac, 2011 ; Levac et Miller, 2013 ; Nguyen *et al.*, 2019). En particulier, les initiatives de formation devraient permettre aux cliniciennes de comprendre les ingrédients actifs des systèmes de XR utilisés et de résoudre les enjeux qui leur sont associés, afin d'exploiter la XR au bénéfice de leurs patients (Levac et Miller, 2013). Différents modèles de formation pratique ont démontré leur efficacité pour renforcer les compétences des cliniciennes, tels que la combinaison de ressources en ligne et d'une séance individuelle encadrée par une technicienne qualifiée (Levac *et al.*, 2016), ou l'organisation de plusieurs séances de discussion et de pratique en groupe (Kobak *et al.*, 2017). Concernant le contenu des apprentissages, Levac et al. (2017) soulignent l'importance de personnaliser la formation au niveau d'expérience initial des professionnelles et d'ajuster progressivement les activités éducatives. Par exemple, une clinicienne novice aurait besoin de se familiariser avec les technologies disponibles, celle de niveau intermédiaire pourrait apprendre à choisir un niveau de difficulté et planifier une progression, et celle plus avancée pourrait intégrer d'autres approches théoriques lorsqu'il utilise certains systèmes de XR.

1.4.5 Courtiers de connaissances et cliniciennes-championnes

Un rôle intermédiaire dédié à la transmission et à la dissémination des connaissances vers la clinique est fréquemment recommandé pour faciliter l'adoption clinique de la XR (Alt Murphy *et al.*, 2023 ; Banerjee-Guénette *et al.*, 2020 ; Kouijzer *et al.*, 2023). Un exemple de ce type de rôle est celui du courtier de connaissances, qui peut occuper diverses fonctions, allant de la création de contenu éducatif à la gestion des activités d'échange et de communication, en passant par la facilitation et l'évaluation des processus d'implantation (Bornbaum *et al.*, 2015 ; Glegg et Hoens, 2016). Ainsi, cette fonction peut faciliter la mise en œuvre de stratégies variées basées sur le savoir expérientiel et la résolution de problèmes, tel que démontré par une étude Canadienne incluant 11 cliniciennes dans un centre de réadaptation intensif (Banerjee-Guénette *et al.*, 2020). Même s'il est parfois considéré essentiel pour soutenir la motivation des cliniciennes, actualiser les connaissances et pour garantir la pertinence clinique des activités de XR (Alt

Murphy *et al.*, 2023 ; Nguyen *et al.*, 2019), le rôle de courtier de connaissances n'est pas encore réellement implanté dans les établissements de santé, principalement en raison d'un manque de financement (Bornbaum *et al.*, 2015 ; Taylor *et al.*, 2014). Les promoteurs de l'intégration de la XR doivent donc se tourner vers des solutions moins coûteuses pour soutenir leurs activités. Pour répondre à ce défi, la prise en charge par des cliniciennes-championnes est suggérée pour encourager la promotion et l'application des activités d'implantation auprès des pairs (Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023).

1.5 Cadres conceptuels et méthodes d'évaluation

L'adoption d'un cadre conceptuel permet de considérer l'ensemble des facteurs qui influencent la planification ainsi que l'évaluation des impacts des stratégies d'implantation (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023). Des outils tels que "Consolidated Framework for Implementation Research (CFIR)" (Damschroder *et al.*, 2022b) ou le "NASSS Framework" (Greenhalgh et Abimbola, 2019) ont déjà été utilisés pour structurer et évaluer l'implantation de technologies dans le domaine de la santé (Greenhalgh *et al.*, 2020 ; Lin *et al.*, 2022 ; Sung *et al.*, 2022). Le développement d'outils constitue une autre stratégie pertinente. Par exemple, le questionnaire "Assessing Determinants of Prospective Take-up of Virtual Reality" (ADOPT-VR), fondé sur un cadre théorique existant, est conçu pour évaluer l'adoption des technologies de réalité virtuelles et les perceptions des cliniciennes en réadaptation (Glegg *et al.*, 2013). Le devis de recherche devrait également permettre une évaluation compréhensive des facteurs influents : des études de cas rigoureuses, des approches qualitatives telles que la théorie ancrée (Glaser et Strauss, 2022) ou bien les méthodes mixtes constituent toutes des stratégies prometteuses pour évaluer l'efficacité des activités d'implantation et pour mieux cerner les conditions susceptibles de favoriser un impact positif optimal (Bornbaum *et al.*, 2015).

1.6 La *Technothèque*

Nous avons développé la *Technothèque* au Centre de réadaptation Marie Enfant du CHU Sainte-Justine afin de répondre aux défis et barrières limitant l'intégration de la XR en réadaptation pédiatrique. Cet espace de 50m^2 rassemble plus de 150 jeux répartis sur plus de 10 systèmes de XR, tous connectés par une interface de contrôle conviviale. Entre janvier 2022 et août 2023, nous avons consulté des cliniciennes pour évaluer le contexte du centre et utilisé la salle à des fins thérapeutiques lors de camps de thérapie intensive en (Ferron *et al.*, 2023a). À l'automne 2023, nous avons mené une phase pilote pour structurer une offre de service de soutien ainsi que pour codévelopper les instruments de mesure de l'étude. Ce mémoire présente le protocole de l'étude ainsi que les résultats de la première étude de faisabilité de la

Technothèque en tant que modèle visant à soutenir l'utilisation pérenne de la XR dans un centre de réadaptation pédiatrique.

CHAPITRE 2
Article de protocole

2.1 Introduction du chapitre

Ce chapitre présente l'article tiré du protocole de mon projet de recherche, publié sur medRxiv en avril 2025 (DOI: 10.1101/2025.04.15.25325879). MedRxiv est une archive en ligne diffusant des manuscrits complets mais non publiés (prépublications) dans le domaine des sciences de la santé. Ce mode de diffusion a été choisi afin de détailler le développement de la *Technothèque* et du projet de faisabilité, tout en rendant ces travaux rapidement accessibles à la communauté scientifique.

L'article intitulé « *Supporting virtual reality and active video game use in pediatric rehabilitation: Protocol for a mixed-methods feasibility study* » présente d'abord le cadre théorique ayant guidé le développement de la *Technothèque*. Il décrit ensuite les différentes activités d'implantation réalisées avant le début de l'étude de faisabilité, soutenues par le *Consolidated Framework for Implementation Research* (CFIR). Les procédures de l'étude, les mesures employées ainsi que les analyses prévues y sont résumées. Enfin, l'article résume l'analyse quantitative et détaille la méthode qualitative employée lors du projet de recherche afin de pouvoir y faire plus brièvement référence dans le chapitre suivant. Une courte discussion présente les étapes anticipées à la suite de ce projet de faisabilité.

2.2 Abstract

Background: Virtual reality (VR) and active video game (AVG) systems that offer repetitive practice and multimodal feedback in engaging environments are attractive pediatric rehabilitation intervention options. Evidence supports their effectiveness to improve functional outcomes in multiple pediatric populations. However, VR/AVG integration into clinical practice faces multiple barriers, including limited access to these often-expensive technologies, a rapid development sector resulting in frequent obsolescence, and insufficient educational resources to help clinicians select appropriate games that match children's therapeutic objectives. Knowledge translation initiatives that primarily target clinician knowledge and attitudes about VR/AVG use have shown limited success in facilitating adoption. To address these challenges, we used the Consolidated Framework of Implementation Research (CFIR) to structure development of the *Technotheque*, a multi-faceted VR/AVG support initiative at our large pediatric rehabilitation centre. The *Technotheque* addresses both access- and knowledge-based barriers to VR/AVG use via a dedicated gameplay space staffed by knowledge brokers who directly support clinicians in VR/AVG implementation in therapy sessions and provide education towards independent VR/AVG use.

Objective: To evaluate the feasibility of the *Technotheque* as a knowledge translation initiative to enhance VR/AVG use at our pediatric rehabilitation centre, as measured by demand, acceptability, adaptation, and implementation criteria.

Methods: Convergent mixed-methods design. We will use convenience and snowball sampling strategies to recruit clinicians (physiotherapists, occupational therapists, speech therapists, special educators, and neuropsychologists) to participate in this 4-month study. Following informed consent, participants will complete a modified 'Assessing the Determinants of Prospective Take-up of Virtual Reality' (ADOPT-VR2) instrument. Participants can then request individualized training and/or clinical implementation support with our knowledge brokers at a self-determined frequency and duration, and with their choice of clientele. Participants will be free to begin and end their study participation at any point during the four months. Data collection will include study-specific *Technotheque* pre-session objective and post-session feedback forms, a post-study ADOPT-VR reassessment, a CFIR-based satisfaction questionnaire, and individual semi-structured interviews. Quantitative analyses will examine demand (participant demographics, usage patterns, correlations between usage and ADOPT-VR2 scores), acceptability (satisfaction scores in relation to usage patterns and ADOPT-VR2 changes), adaptation (variety of professions, client populations, and clinical objectives), and implementation (pre-post ADOPT-VR2 changes and patterns of support needs over time). Qualitative data will be deductively analysed using the four feasibility criteria as a coding framework. Quantitative and qualitative results will be integrated to identify areas of alignment and/or divergence.

Results: Research Ethics Board approval has been obtained.

Conclusions: The *Technotheque* initiative is designed to address both access and knowledge barriers to VR/AVG use in pediatric rehabilitation. Study results will inform subsequent research efforts to evaluate the effectiveness of VR/AVG as a rehabilitation intervention and to examine the impact of this initiative on sustained VR/AVG use.

Keywords: Virtual reality, active video games, knowledge translation, rehabilitation, pediatrics

2.3 Introduction

Pediatric rehabilitation is a multidisciplinary field in which professionals collaborate to help children with acquired or congenital disabilities address physical, cognitive, and psychosocial challenges and reach their full potential (Murphy *et al.*, 2020). In recent years, many rehabilitation disciplines have incorporated interactive technologies such as virtual reality (VR) within their intervention toolbox. VR is defined as "an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer, and in which one's actions partially determine what happens in the environment" (Kardong-Edgren *et al.*, 2019). This broad definition encompasses visually immersive technologies (three-dimensional virtual environments viewed through a head-mounted display) and non- or semi-immersive environments (two-dimensional virtual environments viewed on a flat-screen display). Semi-immersive visual displays, in which body movements tracked by cameras or sensors control interaction with the virtual environment, are often referred to as active video games (AVGs). VR/AVG systems may be custom developed for rehabilitation use (customized systems) or developed for the public (non-customized systems).

VR/AVGs are used to target physical, cognitive, and psychosocial goals in a variety of pediatric populations, although substantial research efforts explore their use with children with neuromotor impairments such as cerebral palsy (CP) and traumatic brain injury (Iosa *et al.*, 2022 ; Massetti *et al.*, 2018 ; Polizzi *et al.*, 2023 ; Voinescu *et al.*, 2021). Theoretical rationale for VR/AVG use lies in motor learning theory, with arguments that these interventions can target principles of repetition, 'just-right' challenge, augmented feedback, and motivation that improve skill learning and retention (Biddiss *et al.*, 2021 ; Demers *et al.*, 2021 ; Levin, 2011 ; Zanatta *et al.*, 2022). Studies demonstrate that VR/AVG interventions can improve gross motor function, upper extremity use, balance and postural control (Johansen *et al.*, 2019 ; Liu *et al.*, 2022 ; Novak *et al.*, 2020 ; Tobaiqi *et al.*, 2023 ; Wang *et al.*, 2021). Exergaming, defined as the use of AVGs to promote physical activity, has been evaluated in children with autism spectrum disorder, CP and spina bifida (Howcroft *et al.*, 2012 ; Lee et Jin, 2024), implemented in home-based interventions for youth with mobility challenges (Demers *et al.*, 2020), and evaluated as a modality to enhance early mobility in the intensive care unit (Lai *et al.*, 2021). In cognitive and psychosocial rehabilitation, VR/AVG use can offer equitable social participation opportunities (Redepenning *et al.*, 2023) and enable assessment of cognitive functions such as information processing speed and attention in ecological contexts, like simulated classroom environments (Newbutt *et al.*, 2020 ; Pellas *et al.*, 2021).

Despite a growing evidence base, clinicians interested in using VR/AVGs in pediatric rehabilitation face substantial environmental and educational barriers. Knowledge gaps identified by clinicians include limited technical skills, lack of familiarity with available technologies, lack of allocated training time, and uncertainty about matching specific VR/AVG system affordances to individual client goals (Alrashidi *et al.*, 2024 ; Banerjee-Guénette *et al.*, 2020 ; Cho *et al.*, 2024 ; Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2017). In addition, a lack of environmental and organizational support are critical barriers to VR/AVG adoption (Glegg et Levac, 2018 ; Kouijzer *et al.*, 2023). Knowledge transfer initiatives fail to increase usage if environmental barriers are not addressed (Proffitt *et al.*, 2019). For example, structural factors such as dedicated space, accessibility, inadequate Wi-Fi and restrictive firewalls, and insufficient technical support and funding can hinder implementation efforts (Bier *et al.*, 2018 ; Cho *et al.*, 2024 ; Kouijzer *et al.*, 2023 ; Levac *et al.*, 2016, 2017).

Surveys in multiple countries demonstrate that there are varying degrees of VR/AVG adoption across rehabilitation contexts. In Canada, a 2016 survey found that approximately 46% of physiotherapists and occupational therapist respondents reported experience with VR/AVGs, but only 12% were current users (Levac *et al.*, 2017). In the US, about 31% of clinician respondents reported current VR/AVG use in a 2017 survey (Levac *et al.*, 2019). In Korea, 61% of respondents had VR/AVG experience (Cho *et al.*, 2024), while in the UK only 7% of pediatric physiotherapists reported current VR use (Alrashidi *et al.*, 2024). In a 2024 European survey, 45.5% of respondents reported using VR/AVGs, with lack of training amongst the most frequently reported barriers to use (Mensah-Gourmel *et al.*, 2024). Among occupational therapists in Canada, 12.4% recommended technology use within rehabilitation for their elderly clients (Aboujaoudé *et al.*, 2021). Across these studies, non-customized systems (such as the Nintendo Wii/WiiFit and Microsoft's Kinect for Xbox) were more commonly used than customized systems.

Initiatives to support the adoption and use of VR/AVGs in clinical practice include educational resources that address clinicians' knowledge gaps, such as frameworks that classify VR/AVG games and provide decision-making suggestions (Deutsch *et al.*, 2011 ; Espy *et al.*, 2021b ; Galvin et Levac, 2011 ; Levac *et al.*, 2015). Studies have demonstrated that strategies focused on providing education in the form of clinical manuals or online resources (Glegg *et al.*, 2013 ; Levac *et al.*, 2016) can change attitudes and boost self-reported confidence, but that hands-on practice sessions and technical support are essential (Glegg *et al.*, 2017b ; Gustavsson *et al.*, 2022 ; Levac *et al.*, 2016). Integrated knowledge translation strategies that involve clinicians from the beginning, and ideally include a needs assessment process to identify and target site-specific facilitators and barriers, are recommended to ensure that selected strategies align with clinical realities (Glegg et Levac, 2018 ; Murphy *et al.*, 2020). Dedicated personnel to support colleagues, such as a knowledge broker or a clinician champion, can facilitate VR/AVG adoption (Glegg *et al.*, 2017b ; Kouijzer *et al.*, 2023 ; Nguyen *et al.*, 2019).

Given that accessibility is a recognized barrier, the creation of a dedicated VR/AVG play space within a rehabilitation centre can be advantageous (Nguyen *et al.*, 2019). Nguyen et al. (2019) assessed the impact of a 'VR exergaming' room on VR use in a stroke rehabilitation center. In this context, they found that facilitators to VR use included the expert clinician who created individualized programs for clients with different functional abilities, client motivation to use VR, and the opportunity for VR room use to provide additional therapy hours outside of regular sessions. Barriers included staffing limitations, scheduling complexities and inadequate training in using VR in the absence of the clinician champion. The combination of institutional support, dedicated staffing, and comprehensive clinician training appears to be key for effective VR/AVG implementation in rehabilitation.

Guided by this knowledge base, we developed a multi-faceted VR/AVG implementation support initiative called the *Technotheque* at the Centre de readaptation Marie Enfant (CRME) in Montreal, QC. The *Technotheque* is a room dedicated to VR/AVG use and staffed with knowledge brokers: expert consultants who provide educational and clinical implementation assistance to CRME clinicians, with and without the presence of a pediatric client. The room has six gameplay stations hosting 12+ VR/AVG systems and 150+ games, all connected by a user-friendly centralized control system (**Figure 2.1**). We used the Consolidated Framework for Implementation Research (CFIR) to guide the design, implementation and evaluation of the *Technotheque* (Damschroder *et al.*, 2022b ; Skolarus *et al.*, 2017). The CFIR has 5 domains (intervention characteristics, outer setting, inner setting, characteristics of individuals, and process) that provide a comprehensive structure to assess the multiple factors that may influence implementation success. **Table 2.1** outlines how the 5 CFIR domains informed the *Technotheque* development process.

Figure 2.1: The *Technotheque*

Tableau 2.1: *Technotheque* development activities targeted to implementation success, organized by CFIR domain

CFIR domain	*Technotheque* development activities
Intervention Characteristics (VR/AVGs)	• Playtesting and analysis of each VR/AVG game • Development of a classification framework to categorize games based on different therapeutic requirements • Creation of information sheets describing each game and its requirements to inform decision-making • Creation of short video presentation examples of use
Outer Setting (Marie Enfant Rehabilitation Centre [CRME])	• Needs assessment to understand facilitators and barriers to current VR/AVG use at CRME
Inner Setting (The *Technotheque*)	• Identification of a dedicated room • Availability of equipment (e.g., balance boards, weights, mats, adaptive controllers etc.) for adaptations and modifications • Creation of a centralized screen control system to provide a single access point to each VR/AVG system • Preliminary testing of *Technotheque* use in a restricted context (Skolarus *et al.*, 2017) • 3-month pilot phase with 9 clinicians and 13 children and youth
Individual characteristics (Clinicians at CRME)	• Creation of a committee of 'super-users' during the pilot phase to validate fit of *Technotheque* human and material resources with clinical needs
Process (Design of study procedures)	• Super-user committee piloted study procedures and feedback informed changes for the feasibility study • *Technotheque* knowledge broker training • Clinician study participation time (outside of clinical use with clients) paid for by research funds • Administrative support provided for *Technotheque* reservations and study form completion

2.4 Objectives

The overall objective of this study is to assess the feasibility of the *Technotheque*, a knowledge mobilization initiative designed to provide access, training and support for VR/AVG use in one pediatric rehabilitation center. Feasibility will be evaluated through 4 sub-objectives based on key criteria suggested by Bowen and al. (2009) (Bowen *et al.*, 2009); each sub-objective will be evaluated using both quantitative and qualitative measures.

1. **Demand** is defined as the extent to which a new program is likely to be used. Demand will be quantified by the number of *Technotheque* visits and described by nature of VR/AVG use (e.g., systems, games, clinical objectives, and demographic characteristics of clinicians and clients).
2. **Acceptability** is defined as the extent to which a new program is judged as suitable, satisfying or attractive to recipients. Acceptability will be quantified by total score on a post-study satisfaction questionnaire and described in relation to *Technotheque* use during the study.
3. **Adaptation** is defined as how a program performs when changes are made. Adaptation will be described by the variety (or lack thereof) of *Technotheque* use in terms of professions, clients, and functional objectives.
4. **Implementation** is defined as the extent to which a new program can be successfully delivered to the intended participants in some defined, but not fully controlled context. Implementation will be quantified by pre-post study change in VR/AVG attitudes, facilitators and barriers, and described by the nature of *Technotheque* support personnel involvement in intervention sessions. Implementation feasibility will also be described via participant feedback on logistical features of *Technotheque* use such as the reservation system, the required paperwork, and the recruitment events.

2.5 Methods

Study design: This four-month study uses a convergent mixed-methods approach in which quantitative and qualitative data are collected simultaneously and then compared and/or combined for a comprehensive understanding (Creswell et Clark, 2017).

Setting: The *Technotheque* is located at the CRME’s Technopôle in Pediatric Rehabilitation in Montreal, QC. The CRME provides specialized rehabilitation services to children and youth aged 0-18 years with motor or speech disabilities. The CRME operates through six core programs: amputation and other musculoskeletal lesions, communication disorders, cerebral motor deficits, neuromuscular diseases, neuro-traumatology and motor development disorders. The inpatient unit provides intensive rehabilitation to children and youth recovering from traumatic injuries or planned surgeries. CRME services are provided by a team of approximately 130 rehabilitation professionals including physiotherapists, occupational therapists, speech therapists, special educators, and neuropsychologists.

Participants

Inclusion and exclusion criteria

All CRME clinicians who are interested in using the *Technotheque* will be invited to participate in the study. There are no exclusion criteria. There are approximately 130 clinicians at CRME; however, many work with infant and preschool-aged children and therefore would be less interested in using the *Technotheque*.

Recruitment

We will use convenience and snowball (word of mouth) recruitment strategies. The study will begin with a one-week 'open house' event in which dedicated drop-in informational and hands-on trial sessions will be provided for VR/AVG use targeting different clinical goals (for example, balance, fine motor skills, or social participation). Given that clinicians can begin their participation at any point during the 4-month study, there will be weekly drop-in lunch time informational sessions offering hands-on trial opportunities throughout the study. In addition, a monthly e-newsletter will be sent will be sent out to all CRME clinicians, reminding them about the *Technotheque* and the study procedures.

Material: ANNEXE A lists the VR/AVG systems and therapy equipment in the *Technotheque*.

Study procedures

Figure 2.2 outlines the 3 phases of the study procedures. Participants can begin and end their involvement at any point during the study. One of 3 trained *Technotheque* knowledge brokers (rehabilitation students) will be available during regular working hours for the 4-month study.

Phase 1: Preparation

Following informed consent, participants will complete a sociodemographic questionnaire and the Assessing Determinants of Prospective Take Up of Virtual Reality (ADOPT-VR2) instrument before their first *Technotheque* use (described below). Children and youth and their parents will not be required to sign an assent/consent form for *Technotheque* use in the context of this study, as clinicians are choosing to use the *Technotheque* within their regular service offer. However, there will be an option for youth and for parents to participate in a short interview regarding their *Technotheque* experience. Knowledge brokers will complete informed assent/consent procedures with youth participants and their caregivers.

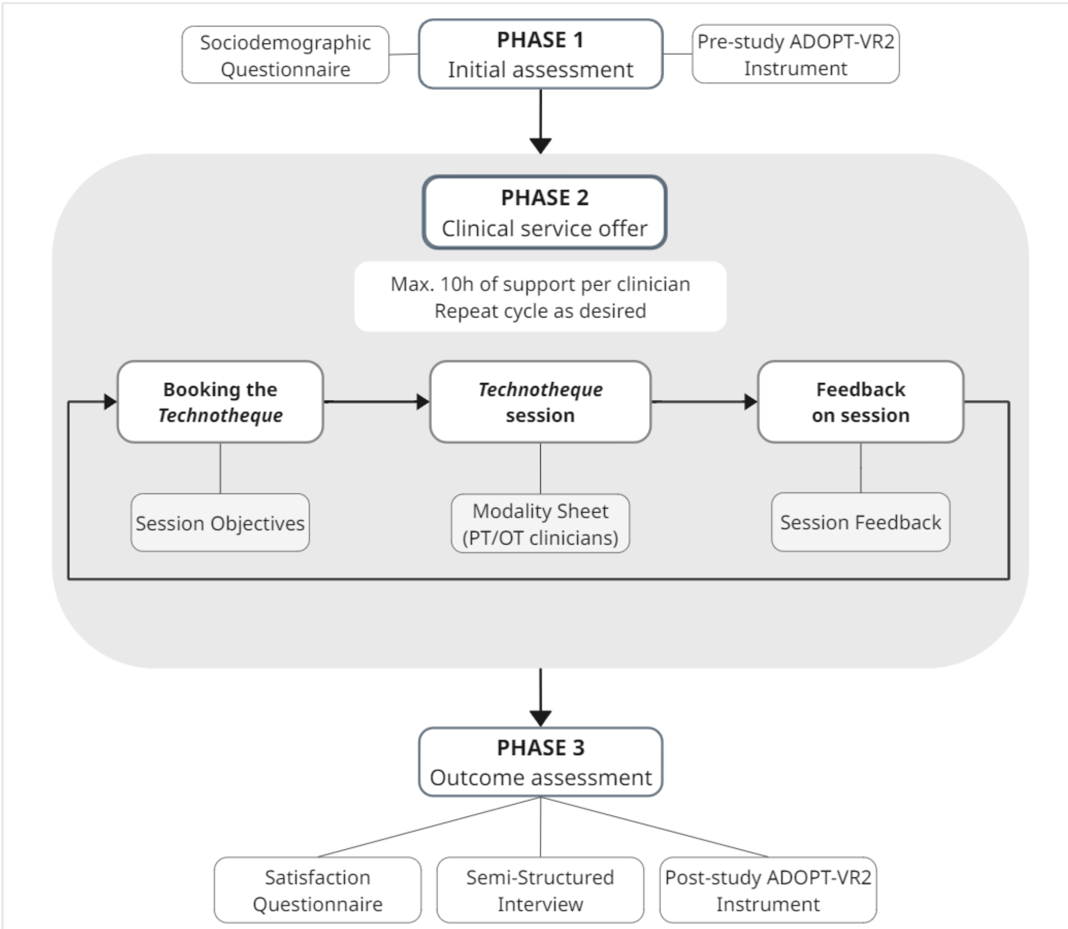
Phase 2: Clinical and educational support services in the *Technothèque*

Clinician participants or the study coordinator will reserve the *Technotheque* for each session using the CRME reservation system. The coordinator, who monitors the reservation calendar, will email the pre-session objectives form for completion by the clinician. Participants can reserve 1 of 2 types of individualized assistance: 1) A therapy session occurring in a clinical context during which the knowledge broker offers game selection and implementation support as well as technical assistance throughout the session. Participants self-select the in-patient or out-patient clients that they choose to bring to the *Technotheque*, as well as the frequency of *Technotheque* use; or 2) An educational session outside of a clinical context in which the knowledge broker provides educational or technical training, for a maximum of 10 hours of paid support. Following each session, the study coordinator will send out the post-session feedback form. Physiotherapists and occupational therapists will also complete a custom modality sheet detailing VR/AVG system and game use; this form is designed to be included in their charting process. In consultation with the knowledge broker, participants can decide at any point when they are ready to move to independent clinical use of the *Technotheque*. This decision can be specific to use of a certain system, and participants can again request assistance with use of a different VR/AVG system. Even while independent, clinicians will be asked to complete the pre- and post-session forms.

Phase 3: Evaluation

At the end of the study, or when an individual participant decides to end their participation at any point during the study, they will be asked to complete the post-study ADOPT-VR2, a CFIR-based study-specific satisfaction questionnaire, and a semi-structured interview.

Figure 2.2: Study procedures



Data collection measures

Sociodemographic questionnaire

Describes clinicians' professional profiles, years of clinical experience, clinical populations with whom they work, and prior personal and professional VR/AVG experience.

Assessing Determinants of Prospective Take-up of Virtual Reality (ADOPT-VR) Instrument

The ADOPT-VR2 is designed to assess clinicians' attitudes and perceptions regarding VR adoption in rehabilitation (Glegg *et al.*, 2013). The instrument has established face and content validity, and high internal consistency (Cronbach's alpha=0.876) as well as demonstrated responsiveness (Glegg *et al.*, 2013, 2017b). The instrument was modified to suit our context, by removing options related to adult patients. The survey consists of 54 items derived from the Theory of Planned Behavior, assessing theoretical predictors of behavioral intention to use VR. The constructs are grouped into three composites: (1) Attitudes: Perceived Usefulness, Perceived Ease of Use, and Compatibility; (2) Social Norms: Peer Influence, Superior Influence, Client Influence; and (3) Perceived Behavioral Control: Self Efficacy, Facilitating Conditions and Barriers. In this study, we will focus on CO, CI, and FCB constructs, with item-level analyses for specific items within the remaining constructs.

Planning and Documentation of *Technotheque* use

Three study-specific forms will capture information related to *Technotheque* use. 1) Session Objectives questionnaire: Prior to each therapy session, participants will complete a short online questionnaire consisting of multiple-choice responses and open-ended questions indicating therapy objectives, reasons for using the *Technotheque*, and providing relevant client information (for example, functional capacities and interests/hobbies). 2) Session Feedback questionnaire: This form combines multiple choice questions and agreement questions on a 7-point Likert scale (with anchors on strongly disagree and strongly agree) documenting clinician satisfaction with each session. The form also provides space to list technical issues or equipment needs. 3) Modality Sheet: Specific to physiotherapists and occupational therapists, this form was created to facilitate documentation of game use to target specific objectives during a therapy session, with the intention of supporting charting activities.

Post-study satisfaction questionnaire

We developed a CFIR-based questionnaire with 56 items distributed across 4 CFIR domains (Innovation, Inner Setting, Individuals, Implementation). Feasibility analyses we will focus on satisfaction-specific questions specific in the Innovation domain (e.g., clinical relevance of available technologies, perceived ease of use, relative advantage of in-person support) and the Inner Setting domain (e.g., compatibility of the service offer with existing administrative procedures, adequacy of the physical infrastructure); these questions can be found in **ANNEXE B**. Internal consistency will be assessed using Cronbach's alpha. With sufficient consistency, a total satisfaction score will be used for analyses. Findings from the remaining questions unrelated to satisfaction will be considered alongside qualitative findings in the mixed methods analysis.

Semi-structured interview

Will be conducted at the end of a clinician's study participation by a research coordinator. The interview guide was developed by the study team to further explore and expand upon CFIR-based satisfaction questionnaire. **ANNEXE C** lists the questions designed to probe clinicians' perspectives on facilitators and barriers to *Technotheque* use. Analyses of youth and parent interviews will be the focus of a subsequent publication and will not be included in feasibility analyses.

2.6 Analyses

Quantitative analyses

Quantitative analyses will be conducted using IBM SPSS Statistics 27, with Shapiro-Wilk tests employed to assess normality of data distributions. Clinician demographic data will be summarized using descriptive statistics.

<u>Objective 1</u>

Demand will be quantified by descriptive statistics summarizing participant demographics, nature of VR/AVG use (e.g., types of VR/AVG systems used, clinical objectives, types of clients), and the number of visits per participant, transformed to percentiles and categorized as low (below 25th percentile), medium (between 25th and 75th percentile), or high (above 75th percentile). Chi-square analyses will be conducted to investigate the relationships between users' demand levels (low, medium, or high) and demographic variables such as pre-study professional or personal use of VR/AVGs and client profile (in-patient vs out-patients).

<u>Objective 2</u>

Acceptability will be quantified by descriptive statistics summarizing post-session feedback questionnaires as well as the post-study Satisfaction questionnaire total score. Mean satisfaction scores will be compared across user demand levels (low, medium, high) using a one-way ANOVA or a Kruskal-Wallis test.

<u>Objective 3</u>

Adaptation will be quantified by descriptive statistics that indicate the variety in *Technotheque* use across client characteristics (sex, age groups, clinical program, functional mobility status and therapeutic objectives).

<u>Objective 4</u>

Implementation will be assessed by parametric or non-parametric within-group pre-post differences in ADOPT-VR2 scores. To control for pre-study *Technotheque* exposure (i.e., participation in the pilot phase), analyses will exclude clinicians who participated in the pilot phase of *Technotheque* development. Implementation feasibility will also be quantified through descriptive statistics and visual analyses of nature of *Technotheque* use over the four-month period with respect to bookings with the knowledge broker vs independent *Technotheque* use.

Qualitative analyses

Semi-structured interviews will be transcribed and analyzed in NVivo 15 using Bowen's feasibility criteria as a predefined coding framework. Any responses to open-ended questions in the post-study ADOPT-VR and the Satisfaction questionnaire will be added to the qualitative data. The qualitative analysis method will follow a 4-step iterative 'critical friends' approach, a collaborative and reflective process where researchers critically engage with one another's data interpretations (Smith et McGannon, 2018).

<u>Step 1: Primary Deductive Analysis</u>

Two investigators (AF, ED) will independently analyze a randomly selected 25% of the transcripts to compare coding approaches, discuss similarities and differences, and iteratively refine the coding framework.

<u>Step 2: Critical Appraisal and Feedback</u>

Two additional study team members will familiarize themselves with Bowen's feasibility criteria and review the same initial 25% of transcripts. AF will then present the preliminary coding and interpretations during a critical appraisal session, where team members will provide constructive feedback. This session will serve as a theoretical sounding board, promoting reflection and encouraging alternative interpretations of the data.

<u>Step 3: Refinement and Iteration</u>

Following the feedback session, AF will revise the coding framework and interpretations based on the group's discussions and consensus. This process will be repeated with the next set of five transcripts, ensuring ongoing refinement and enhanced rigor throughout the analysis. The cycle will continue until all qualitative data has been analyzed.

<u>Step 4: Member Checking</u>

To enhance the trustworthiness of the findings, the study team will invite participants to an optional member-checking discussion where they will have the opportunity to provide feedback on the interpretations (Busetto *et al.*, 2020).

Mixed-methods analyses

The integration of quantitative and qualitative data will follow the procedures outlined in the convergent design framework (Creswell et Clark, 2017): 1) Quantitative and qualitative data will first be analyzed separately; 2) Common concepts will be derived each of the datasets; 3) A joint display (e.g. a table or graph) will be developed to facilitate comparisons; 4) Results will be compared to determine in what ways they confirm, disconfirm or expand each other; and 5) Interpretations will be finalized by the study team and presented in the context of the 5 CFIR domains.

2.7 Results

This study was approved by the CHU Sainte-Justine research ethics committee.

2.8 Discussion

This study will use a convergent mixed-methods approach to explore the feasibility of a multifaceted knowledge mobilization initiative targeting access and educational barriers to the use of VR/AVG systems at a pediatric rehabilitation centre. Although the study is limited to one clinical site, our findings will contribute to the evidence base on the factors that support or limit clinical use of VR/AVGs in pediatric rehabilitation and can identify facilitators and barriers to inform the development of similar initiatives at other sites. Study results will inform the direction of subsequent research directions exploring the potential of the *Technotheque* as a knowledge translation strategy and the clinical effectiveness of VR/AVG use as a rehabilitation intervention.

CHAPITRE 3
Article de résultats

3.1 Introduction du chapitre

Ce chapitre présente l'article découlant des résultats de mon projet de recherche et soumis en novembre 2025 au *Journal of NeuroEngineering and Rehabilitation* (JNER). Le JNER (facteur d'impact 2024 : 5,2) publie des travaux à l'intersection des domaines de la neuroscience, du génie biomédical, de la médecine physique et de la réadaptation, destinés à un public de chercheurs et de cliniciennes. Ce journal a été choisi parce qu'il introduit de nouvelles méthodes et leurs potentielles retombées cliniques en réadaptation, tout en offrant une grande flexibilité quant au nombre de mots, de figures et de tableaux.

L'article intitulé « *Feasibility of the Technotheque to support XR adoption in pediatric rehabilitation: A mixed-methods study* » introduit le changement de terminologie utilisé pour décrire les technologies disponibles dans la Technothèque, passant de VR (réalité virtuelle) à XR (réalité « x »). Cet article présente d'abord le contexte de l'étude en décrivant; les défis liés à l'intégration de la XR en réadaptation pédiatrique, le développement de la *Technothèque* comme modèle de service et la phase pilote de l'étude de faisabilité. Les objectifs du projet sont ensuite exposés, de même que les trois critères de faisabilité retenus (la demande, l'acceptabilité et l'implantation), les outils de mesure mobilisés et les méthodes d'analyse. Les résultats de l'étude sont présentés en trois volets : d'abord les données quantitatives associées à chacun des critères de faisabilité, puis les résultats qualitatifs, pour terminer avec les résultats intégrés, illustrés par trois tableaux qui synthétisent l'interprétation mixte pour chaque critère. Enfin, la discussion propose une interprétation globale de la faisabilité de la *Technothèque* et ouvre la réflexion sur l'évolution des besoins et perspectives des cliniciennes utilisatrices de la XR, ainsi que sur le rôle central de l'engagement dans l'évaluation de ses retombées en réadaptation pédiatrique.

3.2 Abstract

Background: To address the barriers to interactive technology adoption in pediatric rehabilitation (access, space, support, knowledge), we developed the *Technotheque*: a dedicated space equipped with 10+ interactive technologies (XR as an umbrella term) and trained knowledge brokers. This study evaluated the *Technotheque*'s feasibility over a 4-month period and identified factors influencing feasibility at our pediatric rehabilitation centre.

Methods: Convergent mixed-methods design. Feasibility was assessed using three criteria (Bowen et al., 2009): demand, acceptability and implementation. Participation was open to all clinicians at our centre; *Technotheque* use objectives and frequency were self-determined. Measures included descriptive use patterns, self-reported satisfaction, pre-post Assessing Determinants of Prospective Take-up of Virtual Reality (version 2; ADOPT-VR2) scores, and semi-structured individual interviews. Results were integrated using an expansion approach, with qualitative themes contextualizing quantitative findings.

Results: *Demand*: One hundred and forty sessions were conducted: 120 (86.0%) therapy sessions and 20 (14.0%) education sessions. Twenty-four clinicians used the *Technotheque* for therapy a median of 2 times (range: 0-22) with 34 clients of diverse ages, diagnoses and mobility levels; adolescents were most represented (75/120, 62.5%). Clinicians working with in-patient clienteles were the most frequent users. *Acceptability*: Clinicians reported high satisfaction in meeting clinical objectives (median = 6/7, 'Very satisfied'). *Implementation:* A significant pre-post change was observed for the ADOPT-VR2 Client Influence construct (Z = -2.294, p = 0.022*); no change was observed for the other two constructs examined. Overall, 25.2% of the 135 eligible clinicians participated. Most therapy sessions required assistance from a knowledge broker (93/120, 77.5%). Independent use was strongly correlated with number of sessions per clinician (rho = 0.657, p = 0.001**). *Integration: Technotheque* use was driven by caseload relevance, with clinicians basing client suitability on factors such as therapy dosage. Knowledge brokering was essential for aligning XR use with clinical needs and contributed strongly to clinician satisfaction. While the range of XR systems supported varied needs, it also limited clinicians' independence during the study period.

Conclusions: The *Technotheque* represents a feasible model to support XR adoption in pediatric rehabilitation. Findings offer real-world insights into XR adoption. Future research will explore how to improve and adapt the model to other settings.

Keywords: Rehabilitation, Pediatrics, Virtual Reality, Feasibility Studies, User-Centered Design

3.3 Background

Twenty years of evidence support the use of interactive technologies such as virtual reality (VR) or active video games (AVGs) in pediatric rehabilitation (Bonnechère et Deutsch, 2025 ; Chen *et al.*, 2018 ; Fan *et al.*, 2023), yet they remain underutilized in clinical practice (Alrashidi et al., 2024; Levac et al., 2017; Levac et al., 2020). Common challenges include limited access to equipment and adequate therapy space (Alt Murphy et al., 2023; Kouijzer et al., 2023; Shen et al., 2020), clinicians' lack of knowledge and available training time (Glegg et al., 2013; Kouijzer et al., 2023; Levac et al., 2017), organizational issues such as poor Wi-Fi, restrictive firewalls (Bier et al., 2018; Kouijzer et al., 2023), and lack of technical support (Cho et al., 2024; Glegg & Levac, 2018; Kouijzer et al., 2023; Levac et al., 2017).

Knowledge mobilization initiatives designed to support the adoption of interactive technologies in rehabilitation are most effective when co-developed with clinicians and based on site-specific needs assessments (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018). Game classification frameworks and online manuals are tools that can address knowledge barriers and improve clinician confidence (Deutsch *et al.*, 2011 ; Espy *et al.*, 2021a ; Galvin et Levac, 2011 ; Glegg *et al.*, 2017a ; Levac *et al.*, 2015, 2016). However, sustainable use of interactive technologies also requires dedicated time for hands-on practice and ongoing support (Glegg *et al.*, 2017a ; Gustavsson *et al.*, 2022 ; Levac *et al.*, 2016).

Given the complex and interrelated barriers to integrating interactive technologies in clinical practice (Kouijzer *et al.*, 2023), multifaceted initiatives combining access to a dedicated 'games room' with support from knowledge brokers or clinician champions show promise for facilitating adoption (Glegg *et al.*, 2017b ; Nguyen *et al.*, 2019). Yet, these efforts are rare, typically offer short-term clinician training and provide limited equipment. Importantly, none have examined the specific characteristics of pediatric rehabilitation contexts that may impact the implementation of interactive technologies. Pediatric rehabilitation presents unique considerations: children and adolescents with disabilities are in active developmental stages where evolving motor, cognitive and social capacities often intersect with complex family dynamics (Chang, 2022). To the authors' knowledge, no study has yet implemented or evaluated the feasibility of a comprehensive strategy to support the integration of interactive technologies within a pediatric rehabilitation center.

To address this gap, we developed the *Technotheque*, a multi-faceted knowledge mobilization initiative designed to provide access, training, and support to facilitate the adoption of interactive technologies at a large pediatric rehabilitation center. The *Technotheque* is a 50m^2 dedicated space equipped with six gameplay stations and 150+ games across 10+ systems, all connected through a user-friendly centralized control system. Rather than centering its identity around a specific type of interactive technology, the *Technotheque* is designed to evolve with advances in this rapidly developing field to maintain a diverse offering aligning with multiple clinical needs. Accordingly, the equipment portfolio spans a range of interactive technologies within the overall label of xReality (XR), a placeholder term that includes 'all' digital reality formats, including virtual reality (VR), augmented reality (AR), mixed reality (MR) devices, PC or tablet applications (Rauschnabel *et al.*, 2022). Our team has purposefully chosen to describe our portfolio using the term 'XR', proposed by Rauschnabel et al. (2022) to align the field towards a common nomenclature when describing diverse technologies that generate or modify realities. Ferron et al. (2025) provides further details about the *Technotheque*'s development since 2022.

In Fall 2023, the study lead (AF, a kinesiologist) conducted a 4-month feasibility pilot with seven clinicians (three occupational therapists, two physiotherapists and one special educator) and their clients to establish a knowledge-brokering support service within the *Technotheque*. The pilot informed refinement of equipment selection and improvement of service logistics (e.g., reservation system, team communication, and data collection forms). Following the pilot, three additional knowledge brokers (one occupational therapy student, one physiotherapy student, one doctoral student) were trained, and the initiative was presented to leadership to facilitate clinician involvement.

3.4 Methods

Study objectives: The objectives of this study were to evaluate the feasibility of the *Technotheque* at our rehabilitation center over a 4-month period, and to identify factors influencing its feasibility. Feasibility was assessed according to three of Bowen et al.'s eight key criteria (2009), chosen for their direct relevance to our study context:

1. **Demand** is defined as the extent to which a new program is likely to be used. In this study, demand was assessed by describing patterns of *Technotheque* use, including the professional background of clinician users, the frequency and the objectives of use.

2. **Acceptability** is defined as the extent to which a new program is judged as suitable, satisfying or attractive to recipients. In this study, acceptability was assessed by evaluating clinicians' satisfaction with the *Technotheque* service offer and their perceptions of its appropriateness for meeting client needs.

3. **Implementation** is defined as the extent to which a new program can be successfully delivered to the intended participants in some defined, but not fully controlled context. In this study, implementation was evaluated by the proportion of actual users to potential users; pre- post changes in participants' beliefs and perceived barriers to XR adoption, and the number of clinicians who identified as independently able to use one or more XR system during or following the study.

Study design: This study used a convergent mixed-methods approach in which quantitative and qualitative data are collected simultaneously and then compared and/or combined for a comprehensive understanding (Creswell et Clark, 2017). Additional methodological details are available in the study protocol (Ferron *et al.*, 2025).

Setting: The *Technotheque* is located at the Technopôle in Pediatric Rehabilitation of the Marie Enfant Rehabilitation Center of the CHU Sainte-Justine in Montreal, Canada.

Participants

Inclusion and exclusion criteria

Study participation was open to all interested clinicians regardless of profession, clientele (in-patient versus outpatient), or XR experience. There were no exclusion criteria.

Recruitment

Participants were recruited through convenience and snowball sampling strategies. Before study initiation, the research team presented the study procedures at four monthly professional meetings, attended respectively by occupational therapists, physiotherapists, neuropsychologists/psychologists and speech-language pathologists. An email was sent to all clinicians advising them of a one-week open house event during which we provided a schedule with drop-in times dedicated to specific clinical populations and therapy goals. The estimated reach of this communication was over 130 clinicians across all professions. Clinicians were free to join the study or end their participation at any point during the 4-month data collection period. Throughout the study period, a monthly newsletter was sent out, and weekly lunchtime drop-in sessions were held.

Material: ANNEXE A lists the XR systems and support equipment available in the *Technotheque* in 2024.

Study procedures

Details about data collection measures are provided in Ferron et al (2025). Study procedures are illustrated in **Figure 2.2**.

Phase 1: Initial assessment

Following informed consent and prior to their first *Technotheque* session, participants completed a sociodemographic questionnaire which included 1) their professional and personal XR experience and 2) the Assessing Determinants of Prospective Take Up of Virtual Reality (version 2; ADOPT-VR2) instrument. The instrument assesses clinicians' attitudes and perceptions regarding VR adoption in rehabilitation (Glegg *et al.*, 2013). ADOPT-VR2 uses the nomenclature 'VR' but has been applied in prior studies to a broad range of XR systems (Alrashidi *et al.*, 2024 ; Banerjee-Guénette *et al.*, 2020 ; Levac *et al.*, 2020 ; O'Neil *et al.*, 2024). It consists of 54 items derived from the Theory of Planned Behavior, assessing theoretical predictors of behavioral intention to use VR. To alleviate response burden for clinicians, we focused on three constructs: 1) Compatibility (CO): The extent to which therapists believe that the use of VR as a therapy tool fits their current treatment approaches and meets their clients' needs; 2) Client Influence (CI): Therapists' beliefs that their clients will want to use VR in clinical practice; and 3) Facilitating Conditions and Barriers (FCB): Therapists' beliefs about the influence of factors perceived to assist or limit them from using VR in their clinical practice.

Phase 2: Clinical and educational support services in the *Technotheque*

The study coordinator managed session bookings and emailed a pre-session objective form to each clinician prior to their *Technotheque* session. The purpose of the objectives form was to document whether assistance was requested, capture therapy goals and reasons for using the *Technotheque*, and enable knowledge brokers to prepare for the session. One of the three trained knowledge brokers was available during working hours throughout the 4-month study period. Participants could book two types of individualized support: (1) clinical therapy sessions with game selection, implementation guidance, and technical assistance, with clinicians determining the clients they choose to bring to the *Technotheque* and the frequency of *Technotheque* sessions; or (2) educational sessions providing up to 10 hours of paid support outside clinical care. Post-session feedback forms were sent after each session to document functional therapeutic objectives targeted during each session and capture clinician satisfaction. Participants could transition to independent use at any time. Pre- and post-session forms were completed throughout participation, including when clinicians used the *Technotheque* independently.

Phase 3: Outcome assessment

Participants completed the ADOPT-VR2, a CFIR-based study-specific satisfaction questionnaire, and a semi-structured interview at the end of their study participation. We developed the CFIR-based questionnaire following the CFIR (Consolidated Framework for Implementation Research) Interview Guide Questions and Coding Guidelines (Damschroder *et al.*, 2022b). The questionnaire consisted of a 56-item Likert-scale (7-point response scale) covering four domains: Innovation, Inner Setting, Individuals, and Implementation (**ANNEXE B**). In this study, we focused on the 16 satisfaction-related items within the Innovation (e.g., clinical relevance, ease of use, in-person support) and Inner Setting domains (e.g., compatibility with administrative procedures, adequacy of infrastructure). The interview guide (**ANNEXE C**) was developed by the study team to explore key feasibility concepts in greater depth, to expand upon responses from the CFIR-based satisfaction questionnaire, and further probe clinicians' perspectives on facilitators and barriers to *Technotheque* use. Interviews were conducted in French, the center's official working language.

Analyses

Quantitative analyses

Analyses were conducted using IBM SPSS Statistics 27. Descriptive analyses summarize clinician demographic data. Inferential statistics were used to explore preliminary differences, relationships and potential changes within the dataset. A statistician was consulted on two occasions during the data analysis phase to confirm that statistics reflected sample characteristics, given the wide variability in participation involvement.

- **Demand** was quantified by descriptive statistics summarizing participant demographics, frequency and nature of *Technotheque* use (e.g., number of therapy or education sessions). Shapiro-Wilk tests confirmed non-normality of usage data, which included several outliers; as such, participants were grouped in usage percentiles (Koran *et al.*, 2015 ; Schober *et al.*, 2018). The groups were defined as follows: Low-use (below the 25th percentile; 0–1 session), Mid-use (25^{th} to 75^{th} percentile; 2–5 sessions) and High-use (above the 75^{th} percentile; more than 5 sessions). Pearson Chi-square tests were conducted to explore differences in demographic variables (such as pre-study professional or personal use of XR and client profile (in-patient vs out-patients) between user groups.

- **Acceptability** was quantified through descriptive analyses of a satisfaction question from post-session feedback questionnaires on a 7-point Likert scale ranging from "Completely unsatisfied" to "Completely satisfied." Client-focused sessions rated (1) their satisfaction with how the session's activities aligned with therapeutic goals and (2) their perception of the client's enjoyment. Educational (client-free) sessions rated their satisfaction with how well the session aligned with their initial needs. Acceptability was also quantified by total score of the post-study satisfaction. Cronbach's alpha assessed internal consistency of the total score (α = .803), enabling use of the total satisfaction score.
- **Implementation** was assessed using three main indicators: (1) clinician uptake among all employed professionals at our center, (2) clinicians' level of independent use of the *Technotheque*, used as a proxy for increased competency and confidence with XR, and (2) pre-post changes in ADOPT-VR2 scores. Independent use was summarized with descriptive statistics and defined as the number of therapy sessions conducted without support personnel. Spearman correlations explored relationships between independent use and other *Technotheque* usage indicators (total number of sessions, highest number of sessions with one client and number of different clients per clinician) over the 4-month period. To minimize bias from previous exposure, 7 participants who took part in the 2023 pilot phase were excluded from the ADOPT-VR2 pre-post analysis. Wilcoxon Signed Ranks tests were then used to evaluate changes across ADOPT-VR2 constructs for the remaining participants.

<u>Qualitative analyses</u>

Semi-structured interviews, as well as responses to open-ended questions in the post-study ADOPT-VR2 and the post-study Satisfaction questionnaire, were transcribed and analyzed using NVivo 15. Deductive thematic analyses used the 3 feasibility criteria structuring the study objectives as a predefined coding framework, enabling themes to emerge related to demand, acceptability and implementation feasibility. Three researchers conducted the analysis (AF: study lead and knowledge broker; JH: doctoral student and knowledge broker; ED: research coordinator). The qualitative analysis method followed a 4-step iterative 'critical friends' approach, a collaborative and reflective process where researchers critically engage with one another's data interpretations (Smith et McGannon, 2018). This approach is detailed in our protocol (Ferron *et al.*, 2025). Following the qualitative analysis, all participants were invited to a member checking session, during which key findings were presented and discussed. The eight attending clinicians confirmed their agreement with the main interpretations. A large language model (ChatGPT) was used as a writing support to refine thematic sentences and reduce word count.

Mixed-methods analyses

Quantitative and qualitative data were integrated following procedures outlined in the convergent design framework (Creswell et Clark, 2017): 1) Quantitative and qualitative data were first analyzed separately; 2) Common concepts were identified in each of the datasets; 3) A joint table was developed to facilitate comparisons; 4) Results were compared following an expansion approach; The research team selected themes and subthemes that best helped explain the quantitative findings, or that demonstrated contradictions or complexities that may require further investigating (Palinkas *et al.*, 2011). This selection was made regardless of the specific feasibility criterion under which they had been initially coded. For example, a theme originally coded under *acceptability* could also be used to contextualize quantitative results related to *demand*, recognizing the interrelated nature of the feasibility dimensions. Selection was guided by participants' qualitative statements that linked constructs across criteria. All qualitative content that was not directly related to the quantitative measures was removed and will be presented in a subsequent publication; 5) Interpretations were finalized by the study team.

3.5 Results

3.5.1 Quantitative results

1- Demand

Frequency and nature of *Technotheque* use

Over the 4-month study period, 31 clinicians used the *Technotheque* for a total of 140 one-hour sessions. An additional 3 clinicians completed the pre- post- study questionnaires but did not use the *Technotheque*. Of these sessions, 120 (86%) were conducted by 24 clinicians (71%) with a client during therapy, while the remaining 20 were individual education sessions (therapist-only, without a client). Clinicians used the *Technotheque* a median of 2 times (range: 0–22 sessions), each with a median of 1 client (range: 0–5). **Table 3.1** provides detailed characteristics of study participants and their *Technotheque* use, including the number who previously participated in the 2023 pilot phase.

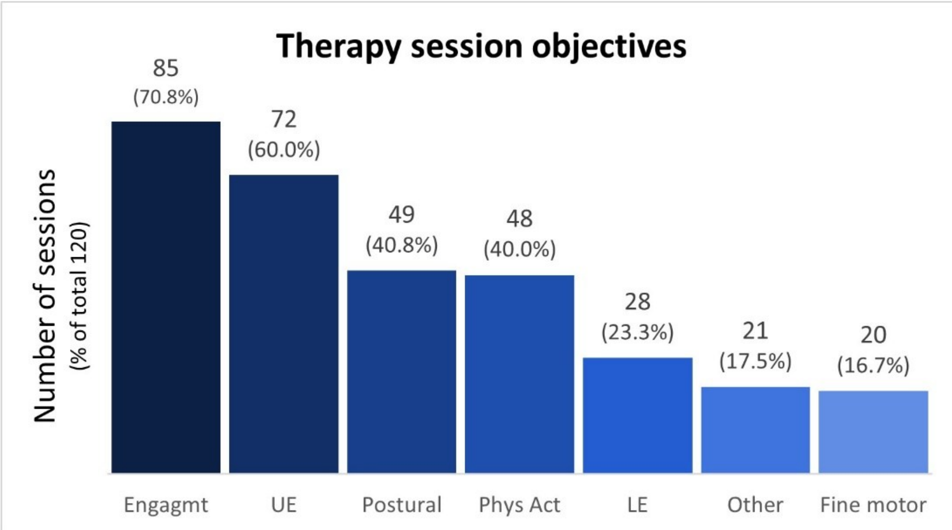
Pilot phase participants – who were all clinicians working with in-patient populations – and other participants working with in-patients were more likely to be mid- or high-level users. When using the *Technotheque* with a client, clinicians targeted a median of 2.5 functional objectives per one-hour session (range: 1–6 objectives). **Figure 3.1** shows the distribution of session objectives as a percentage of total sessions involving a client (120); as visualized, 71% of sessions targeted engagement in therapy as a session objective. We included 'engagement' as a session objective based on feedback during the pilot phase in which clinicians noted that they often strove to facilitate effortful participation in therapy sessions. **Figure 3.2** illustrates the objectives of education sessions.

Tableau 3.1: Participant demographics by usage group

Clinician characteristics	**Total n=34 (%)**	***Low-use n=12 (%)***	***Mid-use n=15 (%)***	***High-use n=7 (%)***	**Exact p Value[a]**
Profession					
Occupational therapist	14 (41.2%)	*4 (33.3%)*	*7 (46.7%)*	*3 (42.9%)*	-[b]
Physiotherapist	10 (29.4%)	*4 (33.3%)*	*5 (33.3%)*	*1 (14.3%)*	
Neuropsychologist	4 (11.8%)	*2 (16.7%)*	*1 (6.7%)*	*1 (14.3%)*	
Special educator	3 (8.8%)	*0 (0.0%)*	*1 (6.7%)*	*2 (28.6%)*	
Speech language pathologist	2 (5.9%)	*2 (16.7%)*	*0 (0.0%)*	*0 (0.0%)*	
Teacher	1 (2.9%)	*0 (0.0%)*	*1 (6.7%)*	*0 (0.0%)*	
Professional experience (years)					
Min-Max, Median	0-32, 5.5	-	-	-	-[b]
Caseload includes in-patient clients					
Yes	16 (47.1%)	*2 (16.7%)*	*8 (53.3%)*	*6 (85.7%)*	p= 0.010** $x^2(2) = 8.88$
No	18 (52.9%)	*10 (83.3%)*	*7 (46.7%)*	*1 (14.3%)*	
Has used XR at least once in a professional context					
Yes	25 (73.5%)	*8 (66.7%)*	*12 (80.0%)*	*5 (71.4%)*	p= 0.880 $x^2(2) = 0.629$
No	9 (26.5%)	*4 (33.3%)*	*3 (20.3%)*	*2 (28.6%)*	
Uses XR for personal or recreational purposes					
Yes	11 (32.4%)	*5 (41.7%)*	*3 (20.0%)*	*3 (42.9%)*	p= 0.448 $x^2(2) = 1.874$
No	23 (67.6%)	*7 (58.3%)*	*12 (80.0%)*	*4 (57.1%)*	
Participated in the pilot phase					
Yes	7 (20.6%)	*0 (0.0%)*	*3 (20.0%)*	*4 (57.1%)*	p= 0.011** $x^2(2) = 8.83$
No	27 (79.4%)	*12 (100.0%)*	*12 (80.0%)*	*3 (42.9%)*	

Legend:
[a]= Difference across use groups based on the Pearson Chi-square test
Low-use= 0–1 session; Mid-use= 2–5 sessions; High-use= > 5 sessions
[b]= Analysis not performed due to insufficient sample size or unmet test assumptions
*p ≤ 0.05, **p ≤ 0.01

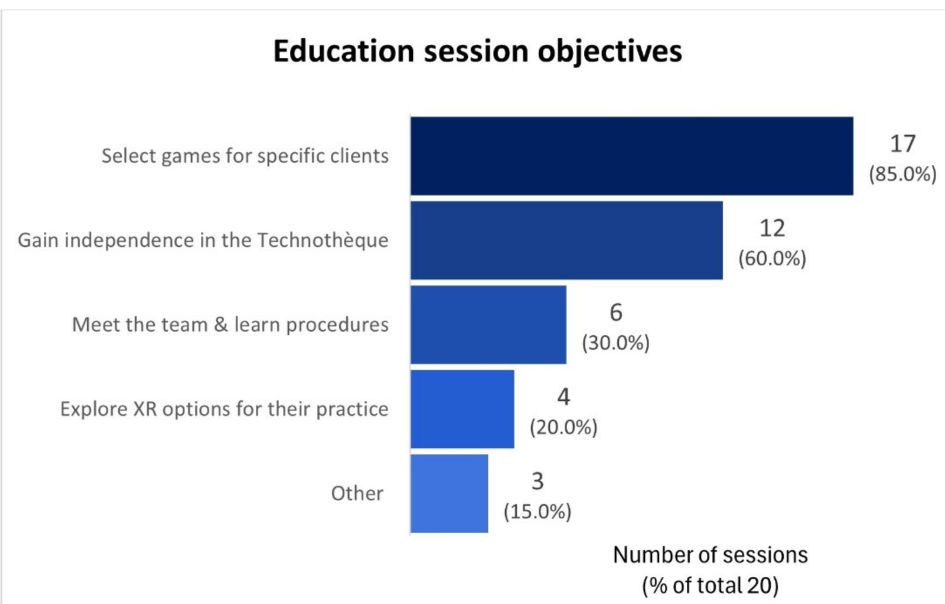
Figure 3.1: Therapy objectives targeted by clinicians in *Technotheque* sessions



Note: Multiple objectives could be selected per session; totals exceed 100%.

Legend: Engagmt= Support client engagement during therapy; UE= Improve Upper Extremity strength, range of motion or coordination; Postural= Improve seating or standing postural control or balance; Phys Act= Promote cardiovascular effort or reduce sedentary behavior; LE= Improve Lower Extremity strength or coordination; Other= Objectives related to participation, speech, learning or cognitive functions; Fine motor= Improve hand grasp or finger dexterity.

Figure 3.2: Clinicians' objectives when requesting an education session in the *Technotheque*



Note: Multiple objectives could be selected per session; totals exceed 100%.

2- Acceptability

Client characteristics

As the *Technotheque* was available to all client populations, descriptive statistics of the types of clients selected by clinicians reflect the perceived suitability of the service for the pediatric clientele. **Table 3.2** summarizes the diversity of client characteristics and the frequency of sessions associated with each.

Tableau 3.2: Client characteristics and associated use of the *Technotheque*

Client characteristics	Number of clients n=34 (%)	Number of sessions n=120 (%)
Sex		
Male	18 (52.9%)	73 (60.8%)
Female	16 (47.1%)	47 (39.2%)
Age group (years)		
0-5	2 (5.9%)	2 (1.7%)
6-12	12 (35.3%)	35 (29.2%)
13-17	19 (55.9%)	75 (62.5%)
18-21	1 (2.9%)	8 (6.7%)
Program		
Amputation and other musculoskeletal lesions	2 (5.9%)	3 (2.5%)
Communication disorders	1 (2.9%)	1 (0.8%)
Cerebral motor deficits	3 (8.8%)	3 (2.5%)
Intensive Functional Rehabilitation Unit (IFRU)	3 (8.8%)	30 (25.0%)
Motor development disorders	0 (0.0%)	0 (0.0%)
Neuromuscular diseases	6 (17.6%)	18 (15.0%)
Neurotraumatology	17 (50.0%)	63 (52.5%)
School Rehabilitation	2 (5.9%)	2 (1.7%)
Functional mobility		
Lower extremities		
Walks independently	16 (47.0%)	37 (25.9%)
Uses a technical aid / Balance impairment	9 (26.5%)	46 (32.2%)
Always uses a wheelchair	9 (26.5%)	37 (25.9%)
Upper extremities		
No limitation	16 (47.0%)	60 (42.0%)
Unilateral impairment	11 (32.4%)	39 (27.3%)
Bilateral impairment / Other	7 (20.6%)	21 (14.7%)

Post-session satisfaction

After each session, clinicians completed satisfaction ratings using a 7-point Likert scale ranging from “1 = Completely unsatisfied” to “7 = Completely satisfied.” Following education sessions, clinicians (n = 16) rated their satisfaction with how well the session aligned with their initial needs. Across 20 sessions, satisfaction scores ranged from 5 to 7 (median = 7). Following therapy sessions, clinicians (n = 24) rated their satisfaction with how the session's activities aligned with therapeutic goals and their perception of the client's enjoyment. Across 120 therapy sessions, clinician satisfaction scores ranged from 2 to 7 (median = 6), while perceived client enjoyment scores ranged from 3 to 7 (median = 6). Lower scores were typically associated with specific challenges reported by participants, such as camera detection issues with a small-statured client in a large wheelchair, or limited XR options for a client with severely impaired bilateral upper-limb mobility. When examined by client characteristics (**Table 3.2**)—including sex, age, rehabilitation program, and functional mobility—average satisfaction scores ranged from 5.8 to 7.0 (median = 6). This lack of change suggests consistent satisfaction from both clinicians and clients across various clinical profiles.

<u>Post-study satisfaction</u>

The CFIR-based post-study satisfaction questionnaire was completed by clinicians (n=22) who had used the *Technotheque* with a client at least once and self-identified as having sufficient experience to provide informed feedback. Out of a maximum score of 112, participants reported high satisfaction levels (Mean = 99.92, SD = 8.11, range: 82.25–110.50).

3- Implementation

<u>Clinician uptake across the Marie Enfant Rehabilitation Center</u>

Out of a total of 135 clinicians, 34 (25.2%) participated in the *Technotheque* feasibility study.

<u>Clinicians' independent use of the *Technotheque*</u>

Out of 120 therapy sessions, most (93 sessions, 77.5%) required assistance from a knowledge broker. Independent use was strongly positively correlated with the total number of *Technotheque* sessions per clinician (rho = 0.657**, p = 0.001), the highest number of sessions with a single client (rho = 0.604**, p = 0.002), and the number of different clients brought to the *Technotheque* by a single clinician (rho = 0.472*, p = 0.020). No significant relationship was found between the number of educational sessions attended and independent use (rho = 0.124, p = 0.564).

<u>Pre- post- change in ADOPT-VR2 scores</u>

Table 3.3 presents the Wilcoxon signed-rank test results for the three ADOPT-VR2 constructs of interest in this study, excluding pilot users (n=27). A significant pre-post difference was observed for the *Client*

Influence construct, indicating a shift in clinicians' perceptions of the *Technotheque*'s suitability to their clientele following the feasibility study. No significant differences were found for the *Compatibility* or the *Facilitating Conditions and Barriers* constructs, indicating stable views regarding how well the *Technotheque* aligns with existing practices and perceptions of organizational support and constraints.

Tableau 3.3: Pre-post ADOPT-VR2 scores

ADOPT-VR2 Construct	***Median Pre (IQR)***	***Median Post (IQR)***	***Z Statistic***	***p Value***
Client Influence	6.0 (5.0-7.0)	6.0 (5.0-9.0)	-2.294	0.022*
Compatibility	6.5 (5.0-8.0)	7.0 (5.8-8.0)	-0.183	0.855
Facilitating Conditions and Barriers	6.6 (5.7-6.9)	6.8 (5.8-7.5)	-0.700	0.484

Legend: IQR = Interquartile range; *p ≤ 0.05

3.5.2 Qualitative results

Thirty-three clinicians participated in individual interviews. Nine themes, each with multiple subthemes, were identified in the context of the 3 feasibility criteria as expanding on the quantitative measures presented in this study, including an overarching theme (clinician characteristics) that emerged inductively to capture influential factors that did not align with the predefined feasibility criteria. Quoted excerpts are labeled with participants' study ID and professional discipline to facilitate contextual interpretations. Disciplines are abbreviated as follows: physiotherapy (PT), occupational therapy (OT), special educator (SE), neuropsychologist (NP) and speech-language pathologist (SLP).

Demand: Key factors impact clinicians' use of the *Technotheque*

Four subthemes describe the most influential factors impacting clinicians' use of the *Technotheque* during the study period:

i) The presence of support personnel encourages Technotheque use.

The presence of a dedicated knowledge broker was consistently identified as a major facilitator influencing clinicians' decision to engage with the *Technotheque*. As one clinician reflected: *"Personally, [the support offer] helped me a lot — really, a lot. I think I probably would have been more hesitant to try without it." (T10_PT)*

ii) Time constraints limit clinicians' capacity for learning.

While all participants showed interest when agreeing to participate in the study, clinicians reported that their schedules left little flexibility to attend the remunerated educational sessions that were available to them. For example, one clinician reflected, *"It's hard to just stop (…) I need to see it, I need someone to show me, but at the same time, finding the time to go is also difficult." (T22_PT)* Interestingly, the impact of time scarcity on exploration/learning extends beyond the *Technotheque*, as described by another participant: *"Even with my conventional modalities, I always use the same games. (…) It's hard to learn how to use a new modality or a new game on our own, whether it's technology-based or even just a board game. With the workload we have, it's almost impossible." (T08_OT)* To remedy this, clinicians suggested organizing mandatory educational sessions that integrate seamlessly into their routine: *"With open lunch sessions, only those who are already interested tend to show up — but people are often overwhelmed, and they use their lunch break to relax. So, if someone doesn't already have a spontaneous interest in the Technotheque, they might not come. (…) In an administrative meeting context, though, it could be really relevant, because that's when all the clinicians are gathered together." (T38_OT)*

iii) Familiarity with the Technotheque builds confidence and autonomy.

Clinicians who had sustained opportunities for exposure to the *Technotheque* during the pilot or the 4-month study reported greater awareness of available equipment and support options, which appeared to motivate use: *"Because I knew the Technotheque from the pilot project, I felt comfortable going. I knew what was available, and having someone there to say, 'Yeah, let's try it, that could work,' was really motivating for me." (T02_SE)* By contrast, clinicians with limited opportunities to engagement often lacked clarity about available resources, which may have reduced their motivation or confidence. For example, one low-use clinician asked, *"(…) it would be helpful to have (…) someone on-site who can handle troubleshooting and basic questions when we can't find the answer ourselves. I don't remember if that exists." (T16_OT)* Unsurprisingly, repeated and varied use of the *Technotheque* also fostered opportunities for clinicians to build autonomy. A pilot-phase participant who had gained more extensive experience illustrated this natural progression: *"I went several times with different youths from the inpatient unit and also from my outpatient program – often on my own, sometimes with the specialized educator, and occasionally with the occupational therapist – but always with [knowledge broker] accompanying us. After the pilot phase of the project ended, I continued bringing clients, but without their presence. So once I felt ready to use the Technotheque, I kept using it more independently." (T03_PT)*

iv) Caseload relevance drives Technotheque use.

Most clinicians emphasized that their caseload during the study period was a significant factor influencing use of the *Technotheque*, particularly given the self-guided design that granted them full discretion over which clients to involve and how frequently. As one participant explained, *"I would have really liked to be* *more involved, but I didn't necessarily have patients who responded well to that modality. So, you have to go with the patients you have." (T01_PT)* Consistent with this client-centered approach, clinicians chose to use XR when they believed it would support rehabilitation goals and align with the client's interests: *"I consider XR to be an additional modality for achieving rehabilitation goals. It will be selected if it offers potential for goal attainment and if it aligns with the young person's interests or sources of motivation." (T38_OT)*

b) Acceptability: Client suitability

i) School-aged children or adolescents are most appropriate for the Technotheque.

The *Technotheque* was perceived as better suited to school-aged clients than to younger children, either due to concerns about screen time – *"With young children, [use of XR] is not the first recommendation I would think of, given the negative effects of excessive screen time on development." (T09_OT)* – or because virtual games were seen as less relevant to early developmental objectives: *"For very young children, we're often talking more about rehabilitation for activities of daily living or fine motor skills that are precursors to kindergarten. I see that as less relevant when it comes to video games. For instance, cutting with scissors… There aren't 46,000 ways to work on that." (T38_OT)*

ii) Low client engagement in conventional therapy drives clinicians to use the Technotheque.

Challenges with a client's engagement in therapy influenced decisions to use the *Technotheque*, based on the rationale that XR could enhance participation. This clinician reflected: "*I went there very often (…) with youth who lacked motivation for conventional therapy. So it's not a diagnosis per se, but I could see that my impact in the physiotherapy gym was more limited." (T03_PT)* Notably, engagement difficulties were described as more common with teenagers than older clients*: "I think [the Technotheque] is a great modality to specifically engage the teenage clientele, who are generally less engaged and harder to mobilize." (T16_OT)* Another clinician attributed this challenge to the limited availability of age-appropriate tools for older pediatric clients: *"I mostly work with teens, so sometimes the games we have in occupational therapy feel a bit childish. (…) I often end up using materials that aren't really age-appropriate, just trying to find something that works." (T08_OT)*

iii) Client interest in gaming or technology contributes to decisions about Technotheque suitability.

Clinicians tended to prioritize the *Technotheque* when clients reported new technology or video games as a personal interest, *"It gives us another modality that often ties into activities that are meaningful for the youth. You know, when we ask young people what their hobbies are, they'll say video games, that one always comes up." (T04_OT)* Interestingly, some clinicians perceived male youth as generally more attracted to technology-based interventions than female peers, as one noted: *"It's more from my personal perspective, but I feel like it really resonates with adolescents — maybe a bit more with the boys." (T01_PT)*

iv) The Technotheque is suitable for diverse functional abilities and conditions.

The *Technotheque* was viewed as suitable for a wide range of client profiles, regardless of diagnosis or functional presentation. As one clinician explained: *"I think there can be a wide variety of clients and diagnoses, and many different underlying reasons for using the Technotheque." (T20_OT)* Clinicians also emphasized its applicability across mobility levels, suggesting an inclusive potential: *"In terms of client profiles, I'm glad to see that [the Technotheque] can include youth who use wheelchairs, youth who are ambulatory, those working more specifically on upper-limb use, movement, or physical endurance." (T07_PT)*

v) Cognitive ability to understand instructions is a prerequisite for Technotheque use.

Using XR games in rehabilitation was perceived as requiring sufficient cognitive abilities, as clients must understand both the game mechanics and their therapist's instructions. This clinician noted: *"I think you need a good cognitive potential to use the Technotheque to its full potential, nothing more than a mild intellectual disability." (T03_PT)* Some clinicians also expressed concerns about clients' with comprehension difficulties, suggesting that dual-tasking demands could hinder therapeutic outcomes: *"For those with significant difficulties in comprehension and attention, it takes a lot of adaptation so that it doesn't become too overwhelming and so we can keep them focused on what we want to do, not just on the game." (T29_SLP)*

vi) Client cooperation is essential for safe and independent use of the Technotheque.

Clinicians emphasized that their clients' level of collaboration in a therapy session influenced their decision to use the *Technotheque*. Trust in a client's ability to follow instructions and handle equipment responsibly was seen as a facilitator: *"If I know that the child has an interest in video games, they will cooperate, they will respect the equipment, and they will follow instructions at least minimally." (T06_OT)* Conversely, limited trust led to hesitation or avoidance: *"I would be less comfortable going with youth who have oppositional or behavioral disorders, simply because I would be afraid of equipment being damaged, or of them not following instructions (…) otherwise you'll end up having to replace [the equipment] every other week." (T16_OT)* These concerns also had implications for clinician workload and autonomy in the room, given the attention required to manage technological setups: *"In general, we bring clients who are fairly cooperative to the Technotheque, but if a client needed constant one-on-one supervision, or needed to be reassured or stimulated at all times, then that might affect my autonomy in the room." (T01_PT)* *vii) Therapy dosage influences opportunities for Technotheque use, with higher session frequency perceived as more appropriate.*

The frequency of a client's therapy was described as an important determinant of *Technotheque* use. Clinicians explained that frequent therapy sessions could lead to decreased client motivation, particularly in inpatient settings, increasing the perceived value of the *Technotheque*: *"Some of the youth we see very frequently – several times a week – can experience therapy as repetitive. The Technotheque helps break that routine and brings back some motivation to stay engaged. For me, the fact that it allows us to keep working toward our clinical goals is what makes it relevant." (T03_PT)*

Higher therapy frequency also allowed clinicians the flexibility to integrate new approaches without the fear of compromising progress towards goals, as one explained: *"Let's say I see a child four times a week. Let's say I want to work on fine motor skills. I really want to do fine motor activities, manipulating real objects. (…) I would see [the Technotheque] as something to use once or twice a week. It's a good modality for working on strength, endurance… What we need to build function." (T04_OT)*

Regularly scheduled sessions with the same client also encouraged clinicians to invest time in developing skills using XR, fostering more familiarity. One clinician highlighted this dynamic: *"[The Technotheque] is particularly relevant because they're often in-patients here for several weeks (…) If I only have two sessions with a patient, it's more difficult, because for me, it would definitely take several sessions. What I would do is try to discuss a strategy with the patient, something I'd want us to practice using virtual reality. But that still takes a few sessions." (T18_NP)*

In contrast, clinicians working with outpatients often saw clients less frequently, typically for routine follow-up appointments, which left limited time dedicated for therapeutic activities. Under these conditions, some perceived less opportunity to integrate *Technotheque* sessions into their practice: *"I don't really see myself doing a full one-hour session in the Technotheque. (…) Often, we see youth with complex cases, and there's a lot to work on at the same time, with many objectives to address. (…) [I need] to check the orthoses, the wounds, where we're at, and only then can we get started." (T22_PT)*

c) Acceptability: Alignment with therapy objectives

Clinicians' perceptions of the relevance of XR to specific therapy goals also influenced their use of the *Technotheque*. Five subthemes illustrate the types of therapy goals perceived as most compatible:

i) Targeting movement-based abilities is a key-strength of the Technotheque.

Technotheque activities were viewed as especially relevant for targeting physical abilities such as muscular strength and endurance, postural control or cardiovascular health. As one clinician described: *"If a youth needs to work on more global aspects like postural control, standing mobility, or shoulder mobility, then I think yes, we should go to the Technotheque, it's a very good modality." (T06_OT)* The engaging nature of XR was perceived as useful for encouraging movement repetition: "*The Technotheque, through the use of video games, makes it easier to maintain motivation when repeating the same movement to strengthen specific muscle groups." (T38_OT)* Consequently, clinicians highlighted post-surgery rehabilitation as a particularly suitable context for *Technotheque* use: *"For youth we see post-op, when we've reached the stage of pushing a bit more and working on strengthening and more functional activities, I found [the Technotheque] to be really interesting." (T10_PT)* It was also considered valuable for sustaining effort throughout a full session, as illustrated by another clinician: *"My client wasn't able to do 60 minutes of continuous activity. (...) At the Technotheque, that didn't stop him, he pushed himself. I had never been able to work on endurance continuously like that before." (T03_PT)*

ii) Goal generalization represents both a strength and a limitation of Technotheque use.

Beyond improving physical abilities, clinicians described *Technotheque* sessions as useful for applying therapy goals in new functional contexts – a process they referred to as generalization. Some clinicians saw this as a logical progression in their clients' rehabilitation plan, as one explained: *"I feel like [the Technotheque] was the natural next step with my clients, at the end of a [therapy] block where we had worked a lot on the things I wanted to address in the gym (…) moving a bit more into functional activities, jumps, and slightly more realistic scenarios." (T24_PT)* Specialized educators emphasized that goal generalization aligns closely with the nature of their profession, as one mentioned: *"In my professional role, it allows me to work on things that are recommended by other therapists, mainly physiotherapists and occupational therapists. So, the Technotheque really makes it possible to generalize and build on what is done in individual therapy sessions." (T35_SE)* However, while some clinicians valued this generalization focus, others criticized the lack of discipline-specific precision: *"The Technotheque didn't always allow me to work on my specific physiotherapy goals, so I preferred to conduct sessions in the gym, leaving my colleague, a specialized educator, to focus on overall balance, muscular endurance, and general strengthening at the Technotheque." (T01_PT)* In particular, clinicians from non-intensive programs also described the *Technotheque* as lacking specificity, explaining that their therapy referrals were often limited to highly specific families' requests focused on daily living skills such as dressing or feeding.

iii) Supporting clients' psychosocial well-being is a meaningful therapeutic contribution of the Technotheque.

Occupational therapists and specialized educators highlighted the contribution of using XR in therapy to foster children's psychosocial well-being such as feelings of normalcy and empowerment – elements central to their practice. As one occupational therapist explained: *"[XR] can often be adapted to achieve rehabilitation goals, and the client is engaged in an activity they know, even if used differently, which allows them to participate in a normalizing activity that can also be shared with peers." (T04_OT)* In in-patient settings, where hospitalization can heighten psychosocial challenges, clinicians emphasized the particular importance of supporting these aspects. This clinician explains: *"The youth could have some control over what they were doing, since it's a game they have to operate themselves — they were the ones making the decisions. So, given how little control they have over their hospitalization, this allowed them to regain some here [in the Technotheque] (…) It helped reduce the sense of disability a bit, as if to say, 'I'm able to play.'" (T19_SE)*

iv) Transferring technology-based goals to the home environment adds value to Technotheque use.

Where XR lacked specificity for certain goals, some clinicians nevertheless described a high perceived value of the *Technotheque* as a way to test and prescribe exercises for home use: *"We went [to the Technotheque] and it was really interesting to try things out. It was with a family who ended up buying the game afterward so they could reproduce it at home (...) I told myself, okay, it's just one session, but after that, they integrated it, you know, it helped them discover something new. And now, it's one of their rehabilitation tools at home." (T10_PT)* Occupational therapists emphasized that *Technotheque* activities were well aligned with their core objective of supporting daily life participation. This benefit was especially relevant for youth with technology-oriented goals. As one clinician reflected: *"Virtual reality is an interesting modality for addressing certain therapeutic goals, for example, enabling the youth to use a computer or to resume playing video games with friends." (T28_OT)*

v) Enhancing client motivation and engagement is an important therapeutic outcome of Technotheque sessions.

All professionals acknowledged the value of XR in promoting client engagement in therapy, describing both increased efforts and greater emotional investment as key benefits of *Technotheque* sessions. As one clinician described: *"I found it really interesting to see that the youth could make greater efforts, and do so with more enjoyment, compared to performing an exercise mechanically." (T35_SE)* Clinicians who conducted therapy sessions in the *Technotheque* noted that this enthusiasm positively influenced the therapeutic dynamic: *"The patient is motivated and happy to come and do this. That definitely makes the whole experience more enjoyable." (T20_OT)* Engagement was described as a central component of pediatric rehabilitation, positioning the playful nature of the *Technotheque* as a strong facilitator. This clinician reflected: "*We have to remember that in our practice context, the playful aspect is one of the most important parts of our interventions. So I feel like this adds a little bit of magic. The children were really excited to participate." (T15_OT)*

d) Acceptability: Knowledge brokering support services

Findings highlight the strengths and limitations of the dedicated support service through five subthemes:

i) Clinicians value hands-on practice with clients as part of the training process.

The presence of support personnel created opportunities for clinicians to learn a new modality with their clients. Many clinicians found that learning was more effective when embedded in clinical care, as one explained: *"Sometimes you can give me all the theory, but I'll forget it if I don't use it the following week. Whereas if it's with a client, it sticks more. I preferred that." (T22_PT)*

ii) Support personnel improve time efficiency in session planning and therapy delivery.

Knowledge brokers were viewed as instrumental in reducing preparation time, resolving technical issues efficiently, and ensuring smooth transitions between systems. Their assistance allowed clinicians to focus on therapeutic goals and maximize clients' time in session. One clinician, who booked two consecutive sessions to explore different options with multiple clients, explained: *"It was great having [knowledge broker] there to guide me through what was available, to quickly turn on the materials and test out some games based on ideas she had in mind. (…) Since we had a lot to go through in a short amount of time, I wouldn't have been as effective in an afternoon like that, even if I had received training beforehand." (T34_OT)* Given time-constrained schedules, this focus on time efficiency was described as particularly valuable for clinicians learning to integrate new tools: *"With the help of the knowledge broker, we could discuss beforehand how to adapt the activity based on the child's abilities and what we wanted to work on. That was really valuable. It meant I didn't have to do that part on my own, it was faster (…) and it really encouraged me to go there with lots of clients. I didn't have to prepare as much." (T04_OT)*

iii) Dedicated support bridges XR and clinical practice.

Clinicians benefited from the knowledge brokers' extensive practical experience in using XR for rehabilitation, which enabled them to adapt the technology more effectively. As one participant explained: *"[Knowledge broker] gave us a lot of ideas on how to adapt tasks. I think it brought us to another level in terms of how we can use the different systems available in the room. It also helped identify new needs that* *we might not have thought of before. Having someone from the Technotheque with experience across different client populations made it easier to generalize." (T05_OT)* In the context of learning a new modality, this expertise was seen as essential for adjusting difficulty levels and tailoring games to meet individual client needs: *"The people on-site know the games so well that it's easy for them to adapt them to the child's impairments. That's something I don't think I would have been able to do myself, so it really allows us to stay closely aligned with clinical practice." (T02_SE)* This personalization was also reflected in the content of individual sessions, as one clinician described, *"I found it more interesting to spend my one-hour session, analyzing each game based on [my client's] needs, rather than just exploring the Technotheque for fun to see what was available. It felt more meaningful to me to associate it directly with a specific child." (T37_OT)*

iv) Flexible and collaborative support aligns with organizational culture.

Clinicians valued the flexible nature of the *Technotheque*'s support service, which allowed them to choose between one-on-one consultations and real-time assistance during therapy sessions. This flexibility was perceived as responsive to both individual learning preferences and clinical contexts. As one clinician described: *"It was really very, very flexible. We shared our needs, and we were able to approach it in a much more exploratory way. I think it also allowed us to meet different needs." (T26_NP)* This alignment was reinforced by the team's responsiveness to emerging needs based on clinician feedback. One clinician noted: *"I brought up suggestions for improvement, and they acted on them. For example, I said, 'It would be great to buy another Just Dance,' and they did." (T19_SE)* In some cases, flexibility extended beyond their initial scope of support: *"The psychology software wasn't working—we couldn't get it to run. So she took on that project to help us resolve the technical and logistical issue, and she really sorted it out for us. (…) I really appreciated that level of flexibility and versatility." (T27_NP)* Finally, an open, collaborative approach contributed to a positive learning environment that clinicians felt aligned well with their professional culture: *"You're approachable, you know? We can challenge you and you respond well. If something doesn't work, we try something else—it's really, really easy, actually. It was a great experience." (T02_SE)*

v) There is limited applicability of support for cognitive and communication goals.

Neuropsychologists, speech-language pathologists, and teachers found the support offer less applicable to their profession. They described the knowledge brokers' expertise as more aligned with motor rehabilitation, which reduced its relevance for their practice. As one speech-language pathologist shared: *"I noticed it was much more focused on physio and OT in terms of what [knowledge brokers] were* *recommending and were familiar with (…) I felt less like I already had 'ready-to-use' tools." (T21_SLP)* The team's limited familiarity with learning-based, cognitive or communication-focused applications further constrained efforts to tailor acquisitions to these professionals' needs. Nonetheless, professionals outside the teams' primary expertise emphasized that their needs were heard and considered during *Technotheque* consultations. As one neuropsychologist reflected: *"I was actually surprised to see that they were quite open, and you know, we could ask questions and it was like, 'What would you like to have? What did we want to work on by doing this?' In that sense, it wasn't negative at all." (T26_NP)*

e) Acceptability: XR equipment and other materials

Clinicians identified both strengths and limitations of the available equipment and game selection to address clinical needs. Three subthemes summarize their perceptions:

i) Broad XR and materials selection supports varied needs.

Clinicians valued the wide range of games for supporting motivation and engagement across diverse client interests: *"I had kids who preferred dance games—those were available. There were also more sports-oriented options like soccer, and adventure activity games—those were there too. I felt there was a good variety overall." (T10_PT)* Game variety also enabled sessions to be tailored to different mobility levels and motor demands. As one clinician described: *"I really liked that there was a variety, some games where you can move more freely, others that are more cable-based with less manipulation of multiple buttons, and there were also different difficulty levels available." (T34_OT)* Clinicians further appreciated the availability of complementary support materials, which facilitated activity grading and goal-specific adaptations: *"I used the balls in the room. I didn't need to use weights, but I could have if I wanted to increase the challenge… They were available, along with chairs and different surfaces. So for me, everything I needed to work was there." (T03_PT)*

ii) There are limited XR options for cognitive and communication goals.

Neuropsychologists, speech-language pathologists and teachers described limited applicability of available options to target their profession-specific goals. As one neuropsychologist reflected: *"Games that work more on cognitive skills – attention, executive functioning, visual perception – and also language, there wasn't much available in those areas. (…) Expanding the range of options a bit in that regard would be interesting." (T26_NP)*

iii) There are limited XR options for fine motor skill development.

Despite positive perceptions of games and equipment available for addressing motor goals, occupational therapists reported limited opportunities to target fine motor skills beyond basic grasping movements.

One participant reflected: *"The only thing I felt was missing were games that could target fine motor skills more specifically—like finger dissociation or hand and finger strength. (...) There would definitely be demand for that if it existed." (T20_OT)*

f) Acceptability: Physical space

Feedback from clinicians revealed mixed perceptions about the *Technotheque*'s physical space and accessibility. Two contrasting subthemes illustrate this range of views:

i) The room design can be both welcoming and overstimulating.

Many clinicians valued the *Technotheque*'s colorful, welcoming design as a way to engage clients and families. As one noted: *"The room is definitely very inviting. It's certainly more appealing than the space I have in the clinic, with the little Dalmatians and puppies. (...) It may not feel very adult, but it does have a more timeless, all-ages vibe. It creates a nice atmosphere." (T16_OT)* However, some clinicians expressed hesitation, perceiving the space as overly stimulating and potentially disruptive. As one shared: *"You know, [the children] would walk into a really stimulating room, and I'd be afraid they'd break everything." (T21_SLP)*

ii) The room location can be either accessible or inconvenient, depending on intended use.

Clinicians' views on the *Technotheque*'s location varied. Some valued its physical connection to the rehabilitation center, emphasizing how the direct access facilitated integration into hospital-based care. As one clinician explained: *"[The Technotheque] is close to where our patients are hospitalized. (...) the ease of access makes it really interesting." (T27_NP)* Others, particularly those working in the main therapy gyms, saw the location as a limitation when trying to combine conventional exercises with *Technotheque* activities in a single session. As one low-use clinician reflected: *"My goal, the way I would use it, would be more as a complementary modality to my therapies. So I would have liked [the Technotheque] to be more accessible, including being closer to our offices or to a clinical room." (T22_PT)*

g) Implementation: Change in clinician knowledge, competencies and attitudes

i) The large variety of XR systems creates awareness gaps and a steep learning curve.

Regardless of exposure to the *Technotheque*, clinicians mentioned limited awareness of the full range of systems and games available, as well as challenges in developing the technical skills needed for independent use. The extensive variety of XR games and systems, while perceived as a major strength, also created an important learning curve. As one clinician reflected: *"It only ended up being two hours, but I was still able to look at several games and get a bit more familiar with how to turn the systems on and off* *and select games on a few machines. I wouldn't say I was able to get familiar with everything, though." (T22_PT)* Lack of awareness of available options may also have reduced clinicians' confidence in independently adapting sessions or selecting appropriate tools for their clients: *"You know, there are some games I'm pretty familiar with, I know how they work. But if I have a kid who doesn't want to play those particular games, what other options can I use? That, I don't really know." (T02_SE)*

ii) Experiential use of the Technotheque fosters more positive perceptions.

Hands-on exposure to the *Technotheque* broadened clinicians' perspectives on XR as a therapeutic tool. Several clinicians reported that their involvement in the study challenged pre-existing assumptions that video games were inherently passive or non-therapeutic: *"Everything we can do with video games, it's not necessarily something that has to be passive or sedentary, just sitting down, you know? You can run very challenging sessions with certain youths using video games. I think it gave me a bit more perspective and examples around that." (T10_PT)* Others mentioned that their experience reduced perceptions of complexity associated with XR use: *"I thought it would take much more time to prepare or understand, but it really didn't, it was actually very quick." (T37_OT)* Clinicians also highlighted unexpected psychosocial benefits, which contributed to more positive therapy experiences: *"I had rarely seen that girl smile, but at the Technotheque, she was so happy, we were in her element. (...) Seeing how much more positive my physio sessions became for her because we were using video games, that would be my highlight." (T24_PT)* Across clinicians, witnessing positive therapeutic outcomes fostered a shift in attitudes toward XR: *"I really enjoyed it. Seeing the impact it had on my clients also confirmed that it was an important intervention." (T03_PT)*

h) Implementation: Knowledge brokering support service

Qualitative findings underscore the contextual realities of rehabilitation settings, highlighting that dedicated support services in the *Technotheque* should be viewed as a long-term implementation strategy rather than a temporary measure aimed at achieving full clinician independence. Two subthemes illustrate this need:

i) There is an ongoing need for support due to clinical staff and caseload turnover.

Clinicians emphasized the importance of maintaining long-term support services in the *Technotheque*, as requests for assistance continue to evolve and autonomy may fluctuate over time: *"I think that as we keep working with new youth, we may encounter different needs." (T09_OT)* Moreover, clinicians emphasized that learning from one client did not always transfer to another, prompting continued requests for support even after gaining independence. This clinician explains: *"Maybe if I have eight sessions with the same child* *at the Technotheque, I might not need [knowledge broker] for all eight—maybe just the first or second session. But if we change clients—sometimes I think having someone there could still be useful, since it's a new child and a new scenario." (T21_SLP)* Several professionals also questioned the feasibility of independent clinicians assuming the time-intensive task of sharing and sustaining this specialized knowledge: *"Even just for someone changing programs, or for new staff coming in… I think it's really important, because if that support isn't available anymore, it'll end up being the other users who have to take it on. Otherwise, we'll see a drop in attendance, and it'll end up being used only by those who already know the equipment." (T16_OT)*

ii) Technotheque knowledge brokers fill a gap in XR rehabilitation expertise.

Clinicians described rehabilitation culture as favoring peer learning when adopting new tools or protocols: *"Whenever we do something for the first time—whether it's requesting equipment or anything else—we always want to be accompanied by someone who's done it before. But once we've done it ourselves, we feel comfortable and it's fine." (T24_PT)* However, no clinician at our center possessed prior expertise using the full range of available XR systems with diverse rehabilitation clienteles. This absence of in-house or otherwise available expertise created a reliance on knowledge brokers to ensure the *Technotheque*'s continued alignment with clinical needs. As one clinician reflected: *"At least until this modality [XR] is well understood by a large group of therapists, I think it's important to have someone who's more specialized in it." (T31_PT)*

i) Clinician characteristics: Individual factors related to beliefs, attitudes or prior XR experience

Clinicians self-reported individual characteristics additionally inform *Technotheque* study outcomes through two subthemes:

i) Initial familiarity with XR is not required for Technotheque use.

Clinicians described entering the study with differing levels of familiarity and enthusiasm toward XR, yet no clear relationship emerged between these initial differences and the decision to use the *Technotheque*. Most emphasized that clinical needs and client goals had a greater influence on their decision to engage with the service than prior interest or experience. For example, one clinician explained: *"I'm not a video game enthusiast in my personal life, but I can clearly see that in my work, it works with them [the youth]." (T02_SE)* However, interest alone did not always translate into clinical use. One clinician noted: *"We had been thinking about virtual reality for quite a while. It has been in the back of my mind for a long time as something that could be done, but I've had difficulty getting started with it. It hasn't really changed my work at this point." (T27_SLP)* For some, motivation to get involved with the *Technotheque* even stemmed directly from a gap in knowledge: *"For neuropsychology intervention, there isn't much else that exists. So for me, that was a major source of motivation." (T18_NP)*

ii) Fear of technical issues hinders independent Technotheque use.

Paired with limited confidence and time to troubleshoot, fear of technical difficulties emerged as a common barrier to *Technotheque* use. When given the option, many clinicians preferred to request assistance from knowledge brokers to ensure smooth session flow. This apprehension stemmed from the perceived unpredictability of technology: *"If there's no one there, I think that might be a barrier for me to use the Technotheque. I'd be thinking, '(...) if something goes wrong, I have to turn on a dime.'" (T17_PT)* Clinicians also expressed concern about losing valuable therapy time due to technical problems: *"Sometimes we only have 50 minutes with the child, and if we spend 20 of those just trying to understand how it all works, you really have to question whether the benefit is worth the time it takes." (T13_OT)*

3.5.3 Mixed-methods results

Tables 3.4, 3.5 and **3.6** are joint-display tables comparing quantitative and qualitative results and presenting the integrated results from the expansion approach for each feasibility criterion.

Tableau 3.4: Integrated results for the Demand feasibility criterion

Demand *Definition: The extent to which the Technotheque is likely to be used.*		
Quantitative data	**Qualitative data**	**Mixed-Methods interpretations**
Professions High use: Occupational therapists and specialized educators Low use: Neuropsychologists, speech language pathologists and teachers	• *Goal generalization represents both a strength and a limitation of Technotheque use.* • *Supporting psychosocial well-being is a meaningful therapeutic contribution of the Technotheque.* • *Transferring technology-based goals to the home environment adds value to Technotheque use* • *There is limited applicability of support for cognitive and communication goals.* • *There are limited XR options for cognitive and communication goals.*	Demand for the *Technotheque* is driven by clinicians whose practice prioritizes daily life participation and client emotional well-being. Lower use among certain professions reflects limited alignment between *Technotheque* resources and cognitive or communication goal-oriented practice, highlighting the need for discipline-specific expertise to enable broader adoption at our center.
Rehabilitation context High use: Caseload includes in-patient clients	• *Familiarity with the Technotheque builds confidence and autonomy.* • *Caseload relevance drives Technotheque use.* • *Therapy dosage influences opportunities for Technotheque use, with higher session frequency perceived as more appropriate.*	The in-patient context drives demand for the *Technotheque*, due to both relevance for clinical needs and opportunities for clinicians to build familiarity through repeated sessions over time.
Clinician prior XR experience No difference between user groups	• *Initial familiarity with XR is not required for Technotheque use.*	Clinicians' initial familiarity with XR was not an important factor influencing demand for the *Technotheque* during the study period.
Therapy goals Most therapy sessions targeted client engagement and/or gross motor goals.	• *Targeting movement-based abilities is a key strength of the Technotheque.* • *Goal generalization represents both a strength and a limitation of Technotheque use.* • *Supporting psychosocial well-being is a meaningful therapeutic contribution of the Technotheque.* • *Transferring technology-based goals to the home environment adds value to Technotheque use.* • *Enhancing client motivation and engagement is an important therapeutic outcome of Technotheque sessions.* • *There are limited XR options for fine motor skill development.*	Patterns of use reflected which therapy goals were most likely to drive clinicians' demand for the *Technotheque*, with gross motor function and engagement most frequently targeted and limited options available for targeting fine motor goals. However, qualitative reports of psychosocial and participation-related benefits suggest a need for broader outcome tracking to promote and capture the full scope of clinical relevance.

Therapy vs Education sessions Nearly all *Technotheque* sessions (137/140, 97.9%) were tied to the needs of a specific client.	• *Caseload relevance drives Technotheque use.* • *Time constraints limit clinicians' capacity for learning.* • *Clinicians value hands-on practice with clients as part of the training process.*	*Technotheque* demand during the study period primarily reflected immediate clinical needs. Time constraints led clinicians to prioritize client-centered use of the *Technotheque* over general skill development or exploratory learning.

Tableau 3.5: Integrated results for the Acceptability feasibility criterion

Acceptability *Definition: The extent to which the Technotheque is judged as suitable, satisfying or attractive to recipients.*		
Quantitative data	**Qualitative data**	**Mixed-Methods interpretations**
Clients judged as suitable A total of 34 clients were selected for 120 *Technotheque* therapy sessions during the 4-month study period.	• *School-aged children or adolescents are most appropriate for the Technotheque.* • *Low client engagement in conventional therapy drives clinicians to use the Technotheque.* • *Client interest in gaming or technology contributes to decisions about Technotheque suitability.* • *The Technotheque is suitable for diverse functional abilities and conditions.* • *Cognitive ability to understand instructions is a prerequisite for Technotheque use.* • *Client cooperation is essential for safe and independent use of the Technotheque.* • *Therapy dosage influences opportunities for Technotheque use, with higher session frequency perceived as more appropriate.*	In addition to considering therapy goals, clinicians selected clients for *Technotheque* sessions based on a range of perceived suitability factors that extend beyond diagnosis or functional abilities. These included demographic characteristics, personal interests, cognitive abilities, therapeutic alliance and rehabilitation context. Further research is needed to examine how these perceptions shape equitable access and influence the integration of XR into pediatric rehabilitation.
Sex and age Most sessions were scheduled with male clients (61%), and with adolescents (63%). No difference in perceived client session enjoyment across sex or age groups.	• *School-aged children or adolescents are most appropriate for the Technotheque.* • *Low client engagement in conventional therapy drives clinicians to use the Technotheque.* • *Client interest in gaming or technology contributes to decisions about Technotheque suitability.*	Regardless of clients' enjoyment of sessions, findings suggest that clinicians turned to the *Technotheque* when faced with low client engagement, particularly among adolescents. The higher proportion of males may be linked to clinicians' assumptions or client reported preferences related to video games.

Functional mobility Clients with varying degrees of functional mobility in the lower or upper extremities used the *Technotheque*. No difference in post-session clinician satisfaction across rehabilitation program or functional mobility	• *Broad XR and materials selection supports varied needs.* • *Dedicated support bridges XR and clinical practice.* • *The Technotheque is suitable for diverse functional abilities and conditions.*	The *Technotheque*'s relevance across diverse functional profiles is achieved through a broad technology offering supported by dedicated expertise.
Rehabilitation program Most therapy sessions (83/120, 77.5%) were held with clients from the neurotraumatology program or the Intensive Functional Rehabilitation Unit.	• *Targeting movement-based abilities is a key strength of the Technotheque.* • *Supporting psychosocial well-being is a meaningful therapeutic contribution of the Technotheque.* • *Enhancing client motivation and engagement is an important therapeutic outcome of Technotheque sessions* • *Low client engagement in conventional therapy drives clinicians to use the Technotheque.* • *Therapy dosage influences opportunities for Technotheque use, with higher session frequency perceived as more appropriate.*	The *Technotheque*'s acceptability is influenced by alignment with the therapeutic context; programs providing intensive rehabilitation after surgery or injury appear most appropriate, likely due to frequent sessions, functional recovery goals and the need to sustain client motivation.
Post-study satisfaction Respondents to the CFIR-based questionnaire indicated high levels of satisfaction for the *Technotheque*.	**Support service:** • *Support personnel improve time efficiency in session planning and therapy delivery.* • *Dedicated support bridges XR and clinical practice.* • *Flexible and collaborative support aligns with organizational culture.*	Regardless of clinician involvement with the study, findings highlight the presence of dedicated support as one of the *Technotheque*'s greatest strength and a cornerstone of clinician satisfaction.
	Physical space: • *The room design can be both welcoming and overstimulating.* • *The room location can be either accessible or inconvenient, depending on intended use.*	Qualitative feedback from less involved clinicians revealed mixed acceptability of the *Technotheque*'s physical environment. Findings suggest that the relationship between room design, location and clinician engagement warrants further investigation.

Tableau 3.6: Integrated results for the Implementation feasibility criterion

Implementation *Definition: The extent to which the Technotheque service offering can be successfully delivered to the intended participants in some defined but not fully controlled context.*		
Quantitative data	**Qualitative data**	**Mixed-Methods interpretations**
Clinician uptake 25% of all clinicians participated in the study. Median *Technotheque* sessions per participant = 2 (range= 0-22) 10/34 (29%) participating clinicians never used the *Technotheque* with a client.	• *The presence of support personnel encourages Technotheque use.* • *Familiarity with the Technotheque builds confidence and autonomy.* • *Caseload relevance drives Technotheque use.* • *Time constraints limit clinicians' capacity for learning.*	The 4-month study period was insufficient to fully implement and disseminate the *Technotheque* service across all rehabilitation disciplines. Clinician engagement was primarily driven by awareness of the equipment and available support, along with perceived relevance to their current caseload and professional role. However, few clinicians had opportunities to gain sufficient experience to build confidence and skills. Findings highlight the need for tailored and sustained implementation strategies over longer periods of time to increase involvement across the clinical teams.
Clinician training 77.5% of therapy sessions required assistance from support personnel. Strong positive correlation between independent use and greater hands-on experience with clients in the *Technotheque* No relationship between independent use and number of educational sessions attended.	• *Familiarity with the Technotheque builds confidence and autonomy.* • *The large variety of XR systems creates awareness gaps and a steep learning curve.* • *Fear of technical issues hinders independent Technotheque use.* • *There is an ongoing need for support due to clinical staff and caseload turnover.* • *Technotheque knowledge brokers fill a gap in XR expertise for rehabilitation.*	Clinician autonomy develops through supported, repeated hands-on use with clients rather than educational sessions alone. Yet, reliance on support personnel persists due to technical and clinical knowledge gaps, combined with workflow constraints. These findings suggest that *Technotheque* support should be considered a long-term implementation component rather than a transitional training measure.
Pre- post- ADOPT-VR2 change Significant change for the *Client Influence* construct No significant change for the *Compatibility* and *Facilitating Conditions and Barriers* constructs	• *Experiential use of the Technotheque fosters more positive perceptions.* • *Time constraints limit clinicians' capacity for learning.*	The self-directed implementation strategy may have attracted clinicians already open to XR use, limiting change in perceived compatibility and barriers. However, hands-on, positive experiences with clients in the *Technotheque* likely explain the improvement of the *Client Influence* construct.

3.6 Discussion

To our knowledge, the *Technotheque* is the first comprehensive initiative of this scale aimed at addressing barriers to the adoption of XR within a pediatric rehabilitation center. Evaluating the feasibility of multi-faceted initiatives can be challenging due to the interrelated nature of contextual factors that influence feasibility (Bornbaum *et al.*, 2015). We embraced this complexity through a flexible feasibility evaluation protocol embedded within existing clinical routines and open to different levels of clinician participation. This flexibility ensured we were open to new possibilities and challenges with respect to *Technotheque* use.

Our study findings with respect to demand and clinician satisfaction suggest that the *Technotheque* is feasible as a knowledge mobilization initiative in its current form. However, we recognize that the amount of resources that enabled this feasibility – dedicated space, on-site knowledge brokers, paid clinician time, and the funds to acquire new equipment – may not be generalizable to other settings. Given that expanding the *Technotheque* model to other sites is a focus of our research program, we are developing more scalable models that do not require similar resources, such as virtual consultations with our team and a 'knowledge hub' in the form of a website with resources and discussion forums. Here, we discuss insights from our study findings that are generalizable beyond our specific context.

Supporting clinicians beyond technical assistance and educational resources

Our findings align with existing literature underscoring the need for technical support when integrating new technologies in healthcare (de Grood *et al.*, 2016), and specifically XR in rehabilitation (Cho 2024, Nguyen 2019). Study results also echo evidence showing that training should be available over time rather than provided only at technology introduction, as educational needs evolve (Glegg *et al.*, 2017b) and new operational challenges arise with experience (Lee *et al.*, 2025).

In addition, our results clearly indicate that clinicians benefit from the presence of dedicated XR knowledge brokers – colloquially referred to as 'techno-therapists' – to use XR in clinical practice. Beyond 1:1 support during interventions, this role could include creating clinically-accessible syntheses of XR evidence and evaluating existing and new XR systems to identify their clinical potential. While our feasibility study involved students, evidence suggests that clinicians may respond even more to their peers as champions, consistent with other knowledge brokering initiatives in healthcare (Bornbaum *et al.*, 2015 ; Coffetti *et al.*, 2022 ; Glegg *et al.*, 2017b ; Lee *et al.*, 2025 ; Taylor *et al.*, 2014). Given the differences in salary and availability between rehabilitation students and rehabilitation clinicians, subsequent research should identify the advantages and disadvantages of each type of support to determine which is most effective in different clinical contexts.

XR implementation needs evolve over time and with experience

Recent studies show that clinicians with prior XR experience are generally more open to innovation and more comfortable with uncertainty (Cho *et al.*, 2024 ; Schreiter *et al.*, 2025). In our study, however, prior XR experience did not appear to influence openness to the *Technotheque*. This finding is difficult to interpret given that the extent of clinicians' previous XR exposure is unknown. What our results do show is that greater exposure to the *Technotheque* itself appears to shift clinicians' perspectives and increase willingness to adapt. We therefore anticipate that ongoing hands-on experience will continue to shape clinicians' understanding of both the potential and the limitations of the *Technotheque*.

Given participants' varying levels of exposure, some perceptions may also reflect underlying assumptions. For example, clinicians frequently associated *Technotheque* use with adolescent "gamers", despite evidence that youths engage with video games for diverse reasons – e.g. autonomy, exploration, social connection (Király *et al.*, 2022) – which do not always align with structured, one-hour therapy contexts. Further research should examine how clinicians assess *Technotheque* suitability and how these perceptions may evolve when considered alongside clients' perspectives. Indeed, our qualitative findings collected from interviews with therapists, children and parents during this study will be presented in subsequent publications to further elucidate this potential.

Expanding how we value XR in pediatric rehabilitation

The XR literature in pediatric rehabilitation remains largely concentrated on evaluating their effectiveness to improve motor outcomes, particularly within neurorehabilitation (Liu *et al.*, 2022 ; Polizzi *et al.*, 2023 ; Voinescu *et al.*, 2021). Yet, motor improvements can be achieved through numerous evidence-based interventions (Novak *et al.*, 2020). Broader technology adoption models echo this dynamic in healthcare settings: perceived usefulness (de Grood *et al.*, 2016), efficacy (Shoman et Tanzer, 2023) and perceived irreplaceability (Cheung *et al.*, 2019) strongly shape adoption decisions for clinicians. As such, evidence for XR use in motor rehabilitation goals must surmount the inherent obstacles of cost and access to convince clinicians to use these systems when other effective options are already available.

Our findings highlight opportunities to broaden how XR outcomes are evaluated in pediatric rehabilitation. In the *Technotheque*, we found that XR use can address clinical needs that are otherwise difficult to meet – such as targeting technology-specific goals – and that it offers benefits that complement motor goals, including sustaining clients' engagement and supporting their psychosocial well-being. With engagement gaining momentum as an important outcome in pediatric rehabilitation (Antoniadou *et al.*, 2024 ; Melvin *et al.*, 2020), there is strong rationale to investigate how XR-mediated engagement can enhance client-therapist relationships and contribute to therapeutic outcomes.

3.7 Limitations

We acknowledge that this study has several limitations. First, self-selection bias is likely, as participating clinicians may have been more reception to XR than non-participants; as such, we may have missed obstacles that would have been identified by less receptive clinicians. Second, consistent with implementation guidance (Damschroder *et al.*, 2022b), we developed study-specific satisfaction measures with clinicians to ensure their contextual relevance; however, their psychometric properties beyond this setting remain untested. Third, because this paper focused on feasibility according to predefined criteria (Bowen *et al.*, 2009), we intentionally did not structure our interpretation through an additional implementation framework as this added complexity that detracted from the Bowen et al. criteria. Although we assigned quantitative measures to each feasibility criterion, others may have interpreted these criteria differently. Fourth, the originally planned 'adaptation' criterion (Ferron *et al.*, 2025) was removed during analysis once it became clear that its defining characteristics did not align with the available data. Fifth, inferential statistics were exploratory and not based on a priori power calculations: statistical findings should be interpreted with caution and considered preliminary. Finally, assessing the sustainability of XR implementation beyond the 4-month intervention was beyond the scope of this paper. A subsequent publication will integrate the full qualitative data set and examine factors relevant to the Consolidated Framework for Implementation Research (CFIR) (Damschroder *et al.*, 2022a).

3.8 Conclusion

Grounded in the literature on XR adoption, implementation science, and the realities of clinical practice, the *Technotheque* offers a comprehensive model to support the integration of XR in pediatric rehabilitation. Our findings offer new insights into real-world factors shaping XR adoption in a multidisciplinary setting, including how clinicians assess the suitability of client and therapy objectives, how dedicated knowledge brokers help align XR use with diverse clinical needs, and how support and learning evolve in time-constrained environments. In addition to further exploring the effectiveness of the *Technotheque* at our rehabilitation center, subsequent research will explore how the *Technotheque* model can be adapted for sites with different infrastructure and financial resources, thereby contributing to the evidence-based and sustainable use of XR in pediatric rehabilitation.

CHAPITRE 4

Discussion générale

Cette discussion présente les principaux constats tirés de ce projet de mémoire, en revenant d'abord sur le développement du protocole de l'étude mixte, puis en synthétisant les résultats majeurs et leurs implications. La dernière section se penche sur les perspectives de réplication du modèle de la Technothèque et décrit les initiatives en cours dans d'autres contextes cliniques.

4.1 Retour sur le protocole de recherche

L'élaboration et la publication du protocole de cette étude ont nécessité plusieurs décisions qui méritent d'être discutées. Le protocole a été conçu en s'appuyant sur les lignes directrices des études de faisabilité et de la science de l'implantation (Bornbaum *et al.*, 2015 ; Damschroder *et al.*, 2022b). Plus précisément, nous avons utilisé le cadre conceptuel suggéré par Bowen et al. pour orienter l'évaluation, codéveloppé des outils de mesure avec les utilisateurs, offert un niveau de participation flexible, et adopté un devis mixte afin de documenter de manière compréhensive les facteurs influençant la faisabilité. Ensemble, ces choix méthodologiques ont révélé à la fois leurs forces et leurs limites, détaillées dans les prochaines sections.

4.1.1 Publication du protocole d'une étude de faisabilité

Nous avons choisi de publier un protocole de recherche en raison des avantages bien documentés de ce type de publication, notamment la transparence, l'attribution d'un crédit d'auteur ou encore la réduction des biais de publication (Kim, 2022). Cependant, ce choix comporte des limites : il impose un cadre méthodologique plus rigide au moment de publier les résultats, et tout ajustement nécessaire en cours d'étude doit être justifié, souvent sous forme de limites. Dans ce projet de recherche, deux modifications importantes ont été apportées par rapport au protocole initial. Premièrement, nous avons adopté le terme réalité « x » (XR) plutôt que réalité virtuelle (RV), une décision qui reflète mieux l'évolution du domaine et le contexte de l'étude. Bien que ce changement soit fondé, il pourrait être remis en question par certains réviseurs, le terme XR étant encore récent dans la littérature. Deuxièmement, parmi les quatre critères de faisabilité prévus, nous avons retiré le critère d'Adaptation. Cette décision découle du constat que les données quantitatives disponibles n'étaient pas suffisamment alignées avec sa définition et que les résultats qualitatifs étaient difficilement dissociables des critères de la Demande et de l'Acceptabilité (Bowen *et al.*, 2009). Il est probable que la publication d'un protocole pour une étude de faisabilité comporte un risque particulier, puisque ce type d'étude novatrice peut nécessiter des ajustements en cours de route. Dans une situation similaire, la décision de publier ou non un protocole devrait donc être soigneusement réfléchie, en tenant compte des avantages et contraintes propres aux études de faisabilité.

4.1.2 Cadre conceptuel et étude mixte

L'utilisation du cadre de Bowen et al. (2009) a permis de cibler des critères de faisabilité définis dans la littérature, facilitant la communication des résultats. Toutefois, les études de faisabilité constituent par nature les premières étapes d'une innovation, dont la structure et les effets restent encore émergents. Chaque critère repose donc sur une interprétation importante de la part des chercheurs, qui doivent adapter ces définitions au contexte particulier de leur initiative. Dans notre étude mixte, plusieurs discussions ont été nécessaires pour déterminer quelles données quantitatives correspondaient le mieux à chaque critère de faisabilité. L'analyse qualitative a présenté des défis similaires : les facteurs influençant la faisabilité sont étroitement liés et parfois difficilement dissociables. Par exemple, comment distinguer précisément l'Acceptabilité et la Demande lorsque des impressions expriment simultanément une grande satisfaction et un désir accru d'utiliser la Technothèque? Devant ces enjeux, nous avons opté pour une intégration suivant une approche d'expansion, en utilisant les données qualitatives pour contextualiser les données quantitatives. Cette stratégie nous a permis de conserver les nuances entre les concepts sans imposer des frontières strictes qui auraient été arbitraires. Pour de futures études de faisabilité mixte, nous recommandons de définir précisément, et surtout en amont, les indicateurs quantitatifs associés à chaque critère de faisabilité, et de choisir une stratégie d'intégration offrant une certaine flexibilité analytique.

4.1.3 Outils de mesure et faisabilité

Le développement d'outils de mesure adaptés au contexte permet souvent de mieux de saisir les facteurs influençant la faisabilité qu'un outil standardisé. Cependant, ces outils personnalisés ne présentent pas de propriétés psychométriques validées. Pour cette étude, nous avons donc combiné un outil standardisé pertinent (ADOPT-VR2) avec des mesures codéveloppées spécifiquement pour le projet, toutes sous forme de questionnaires auto-rapportés. Ce choix a toutefois augmenté la charge administrative des participants, un enjeu important dans un contexte clinique. D'un autre côté, le processus de codéveloppement mené durant la phase pilote a contribué à instaurer une dynamique collaborative forte avec des cliniciennes-championnes. Rétrospectivement, nous considérons que cette étape clé a favorisé l'acceptation de la Technothèque et de l'équipe de recherche par les cliniciennes du Centre de réadaptation Marie Enfant.

Pour de futures initiatives, ce processus pourrait être optimisé en privilégiant des mesures codéveloppées moins exigeantes pour les participantes, telles que des journaux de bords tenus par l'équipe de recherche ou l'enregistrement vidéo des séances, afin de maintenir la richesse des données tout un minimisant la charge clinique.

4.1.4 Un niveau de participation flexible

Cette étude a été délibérément conçue avec un devis de participation inclusif – toutes les professions cliniques et tous les programmes du centre étaient admissibles – et flexible, les cliniciennes déterminant elles-mêmes leur niveau de participation. Ce choix s'inscrivait dans le critère de faisabilité de l'Implantation, défini comme le potentiel d'une intervention/innovation à rejoindre ses utilisateurs dans un contexte défini, non entièrement contrôlé. Cette approche a permis de dégager un portrait des forces et faiblesses initiales de la Technothèque, ainsi que de leurs répercussions sur la demande des cliniciennes (professions impliquées, quelles clientèles, types de besoins). Toutefois, elle comporte des limites importantes : l'absence de puissance statistique suffisante a empêché la production d'analyses statistiques robustes au-delà d'explorations préliminaires. De plus, la diversité inattendue des professions et besoins exprimés a exigé un nombre d'heures considérable pour adapter l'offre de services aux demandes émergentes. Bien que ces efforts soient difficilement reproductibles dans des milieux disposant de ressources plus limitées, ils ont enrichi cette première étude en révélant des retombées non anticipées, notamment un intérêt marqué pour le développement d'une offre spécifique en orthophonie ou en neuropsychologie. Pour les chercheurs confrontés au choix entre un protocole de participation strict ou plus ouvert, cette expérience suggère que la décision devrait être guidée par les objectifs de l'étude : souhaite-t-on brosser un portrait large des possibilités ou évaluer rigoureusement les effets de l'intervention?

4.2 Résultats principaux et prochaines étapes

Cette étude de faisabilité constitue une première étape pour évaluer la Technothèque en tant qu'offre de service visant à soutenir l'adoption de la XR en réadaptation pédiatrique. Les résultats principaux orientent les perspectives d'améliorations à apporter ainsi que les prochaines étapes de recherche et d'implantation.

4.2.1 Cliniciennes-championnes et impacts sur l'implantation

Pendant la phase pilote, un groupe de cliniciennes-championnes issues des programmes de neurotraumatologie et de l'Unité de réadaptation fonctionnelle intensive (ergothérapeutes, physiothérapeutes et éducatrices spécialisées) ont participé au codéveloppement des instruments et raffiné les procédures. De façon notoire, la demande pour la Technothèque durant l'étude a été principalement portée par ces même programmes et professions, en raison d'un besoin accru de soutenir l'engagement des clients et d'une plus grande capacité à s'approprier les outils pendant leurs séances de thérapie. Ces cliniciennes, impliquées dès le début, ont également rapporté une meilleure connaissance de l'offre de service que celles qui n'avaient pas participé à la phase pilote. Toutefois, cette différence n'a pas été quantitativement mesurée, puisque ces participantes ont été retiré des analyses pré- post- afin d'éviter les biais de familiarité. En combinant les résultats liés à la Demande et les données qualitatives, il demeure toutefois raisonnable de souligner l'effet positif de cette implication précoce. Ces observations s'alignent d'ailleurs avec les recommandations de la littérature, qui insiste sur l'importance d'impliquer les parties prenantes dès les premières étapes du développement pour favoriser l'implantation (Alt Murphy *et al.*, 2023 ; Glegg et Levac, 2018 ; Laver *et al.*, 2017 ; Levac *et al.*, 2016).

À l'échelle du Centre de réadaptation Marie Enfant, des efforts supplémentaires sont néanmoins nécessaires pour répondre à un plus large éventail de besoins. L'implication de cliniciennes-championnes provenant de programmes ou professions sous-représentés dans cette étude (p.ex. programme de développement moteur, neuropsychologie, orthophonie) constitue une étape clé. L'acquisition d'outils spécifiques à ces professions pourrait être une manière d'attirer l'intérêt de nouvelles cliniciennes-championnes. Par exemple, une orthophoniste de Marie Enfant travaille actuellement sur l'application immersive VirtuOR, créée pour réduire l'anxiété chez les jeunes qui bégaient : l'inclusion de cette plateforme dans l'offre de service de la Technothèque pourrait élargir les options d'outils pour les orthophonistes, enrichissant ainsi les collaborations avec ce champ de pratique. Une stratégie d'implantation plus ciblée, comme des formations intégrées aux réunions de programme, pourrait également favoriser une sensibilisation plus équitable dans toutes les équipes. Sur le plan de la recherche, une analyse plus fine des besoins, attentes et pratiques propres à chaque clientèle et à chaque profession permettrait de mieux guider les stratégies de formation et d'appropriation de la XR.

4.2.2 Rôle central du courtier de connaissances

La présence d'un courtier de connaissances dans la Technothèque est une stratégie largement recommandée dans la littérature, mais rarement mise en œuvre faute de financement (Bornbaum *et al.*, 2015 ; Glegg et Hoens, 2016). Notre étude montre que, lorsqu'elle est implantée, cette stratégie est non seulement appréciée, mais également mise à profit : la majorité des séances dans la Technothèque ont nécessité de l'assistance. Les rétroactions témoignent de l'étendue des besoins : soutien technique, conseils adaptés à certaines clientèles, recherche de matériels et de nouveaux jeux. Les résultats suggèrent que ce type de soutien doit évoluer en fonction du développement des compétences cliniques, et que le besoin pourrait diminuer à mesure que les cliniciennes acquièrent de l'expérience pratique. Néanmoins, le rôle du courtier de connaissances apparaît essentiel à court et moyen termes en raison d'un manque généralisé de connaissances cliniques en XR, de la diversité des clientèles et des objectifs, et d'un renouvellement technologique constant (Demers *et al.*, 2020 ; Galvin et Levac, 2011). Les prochaines étapes de la recherche pourraient inclurent la mesure de l'évolution de ce besoin de soutien au fil du temps, ainsi que l'exploration de modèles alternatifs, tels que le soutien virtuel à distance, ou la prise en charge du rôle par une clinicienne-championne plutôt que par des étudiantes.

4.2.3 Perceptions des cliniciennes et développement de la pratique

À nos connaissances, cette étude est la première à mettre en évidence les caractéristiques personnelles des jeunes qui sont perçues comme étant alignées avec l'usage de la XR. Cet apport comble un angle mort de la littérature, qui s'est surtout centrée jusqu'ici sur les conditions médicales pertinentes ou les habiletés fonctionnelles. Nos résultats suggèrent ainsi que la décision d'intégrer la XR en thérapie repose sur un ensemble de variables plus large que ce qui était auparavant envisagé, incluant des considérations liées aux intérêts ou aux traits individuels des jeunes. Nous observons également que l'expérience pratique élargit les perspectives cliniques quant aux clientèles et objectifs thérapeutiques pouvant bénéficier de la XR. En ce sens, des cliniciennes moins exposées pourraient être limitées par leurs propres biais et avoir plus de difficultés à imaginer des applications qu'elles n'ont pas expérimentées elles-mêmes, ce qui ajouterait un autre obstacle à l'adoption de la XR. Pour accélérer et harmoniser cette maturation des pratiques, la mise en place d'un comité de pairs pourrait favoriser le partage d'expériences et enrichir la compréhension collective (O'Connell *et al.*, 2025) du potentiel de la XR. Sur le plan de la recherche, étendre ces échanges entre plusieurs sites cliniques permettrait de documenter les usages de la XR à plus grande échelle afin de faire évoluer la pratique. En ce sens, le critère de faisabilité de l'Adaptation (le niveau de performance d'une innovation lorsque qu'elle est transposée dans un nouveau contexte ou auprès d'une nouvelle population) (Bowen *et al.*, 2009) pourrait être particulièrement intéressant à observer.

4.3 Variantes du modèle de la Technothèque dans d'autres milieux

Tel que présenté dans la mise en contexte de ce mémoire, la Technothèque au Centre de réadaptation Marie Enfant regroupe plus de 150 jeux de XR sur plus de 10 systèmes distincts. Cette diversité s'est avérée utile pour répondre à une grande variété de besoins cliniques et d'intérêts personnels, un indicateur prometteur de l'adaptation de la Technothèque auprès de différentes populations. Toutefois, elle peut également entraîner une courbe d'apprentissage irréaliste pour les cliniciennes souhaitant s'approprier l'ensemble de l'offre. Dans ce contexte, le rôle du courtier de connaissances devient essentiel, tant pour sélectionner les jeux pertinents parmi un large éventail que pour assurer le soutien technique nécessaire à la navigation entre différents systèmes. C'est d'ailleurs l'une des raisons pour lesquels le modèle de la Technothèque est difficilement réplicable tel quel dans d'autres milieux, compte tenu des ressources nécessaires pour le reproduire. Cependant, nous ne considérons pas que les fondements de la Technothèque résident dans les technologies précises qu'elle contient, mais plutôt dans une vision centrée sur l'accès à la XR et sur une offre de soutien adaptée au contexte. Cette section présente les variantes du modèle de la Technothèque déjà établies ou en cours de développement dans d'autres milieux cliniques.

4.3.1 Chariot mobile en unité d'hospitalisation

À l'hiver 2024, l'unité d'hématologie/oncologie du CHU Sainte-Justine a sollicité l'expertise de la Technothèque pour développer une offre de jeux vidéo actifs destinée aux enfants ayant reçu une greffe de moelle osseuse. Cette clientèle, contrainte à un isolement d'au moins quatre semaines, est particulièrement vulnérable au déconditionnement physique. Dans le cadre d'un projet pilote, un chariot mobile équipé d'une seule console a été choisi comme modèle d'implantation, permettant de se déplacer facilement d'une chambre à l'autre. L'équipe de la Technothèque s'est engagée de plusieurs manières selon les besoins de l'équipe : évaluation du contexte clinique, recommandation d'une console et d'une liste de jeux pertinents, formation du personnel à l'utilisation de l'équipement et développement de ressources éducatives telles des fiches de jeux conçues pour les besoins de cette clientèle. Le chariot est encore utilisé à ce jour et l'équipe collabore de nouveau avec la Technothèque pour l'ouverture d'une salle de XR permanente disponible à d'autres clientèles. La pérennité de cette version de la Technothèque sans courtier de connaissances ou personnel de soutien reste à évaluer au fil du temps.

4.3.2 Réadaptation en milieu scolaire

Depuis 2025, la Technothèque collabore avec les ergothérapeutes des écoles adaptées Victor-Doré et Joseph Charbonneau à Montréal en vue d'implanter un service similaire dans leur milieu. Ces écoles accueillent des élèves présentant une déficience motrice importante, pour qui la réadaptation est intégrée au quotidien scolaire jusqu'à la fin du secondaire. Dans le cadre de cette collaboration, les cliniciennes ont été accueillies à la Technothèque pour tester divers jeux afin d'identifier les options les plus pertinentes pour leur clientèle. Les équipements sélectionnés ont ensuite été transportés dans les écoles pour des essais en situation réelle. Une fois l'intérêt confirmé, l'équipe de la Technothèque a accompagné les cliniciennes à la rédaction d'une demande de financement pour l'achat de matériel, du temps de formation, et le développement de ressources. Le modèle envisagé prendra la forme d'un local permanent comprenant de quatre à cinq consoles de XR, intégré à un espace partagé avec d'autres modalités de réadaptation plus traditionnelles. Une clinicienne de chaque école s'est portée volontaire pour agir comme leader de l'initiative et responsable des outils XR.

4.3.3 Reproduction du modèle en France

Grâce à une collaboration de recherche entre la professeure D. Levac et l'équipe du laboratoire BEaCHILD en Bretagne (France), notre équipe a agi comme consultante pour l'implantation du modèle dans deux centres de réadaptation de la région du Finistère. Nous avons d'abord accueilli leur doctorante pendant quatre semaines afin de la former au rôle de courtière de connaissances dans la Technothèque. À son retour en France, celle-ci a élaboré un protocole de recherche inspiré du nôtre, incluant une évaluation de son contexte clinique et des activités de codéveloppement avec les cliniciennes.

J'ai ensuite effectué un stage international dans leur milieu pour présenter la Technothèque aux équipes cliniques et aux gestionnaires, soutenir l'installation des équipements et assurer la formation initiale des équipes. La Technothèque en France est mise en place dans une salle permanente dotée de plus de 80 jeux sur quatre systèmes de XR. Leur modèle de soutien varie selon les sites : l'un bénéficie d'une présence hebdomadaire de deux jours, tandis que l'autre reçoit des formations ponctuelles sur demande. Des ressources éducatives sont également créées sous forme de fiches de jeux à la demande des cliniciennes. Depuis l'automne 2024, l'initiative française cumule plus de 250 séances cliniques entre les deux sites, rejoignant des clientèles d'âges et de profils variés.

La collaboration se poursuit grâce à un financement des Fonds de recherche du Québec visant à soutenir le partage des savoirs et pratiques en XR en réadaptation pédiatrique à travers la francophonie. Les activités prévues incluent des rencontres virtuelles favorisant le partage d'expériences entre les centres participants. Des articles de recherche en cours de rédaction partageront les détails de ces collaborations.

CONCLUSION GÉNÉRALE

Notre étude mixte visait à évaluer la faisabilité de la *Technothèque* au Centre de réadaptation Marie Enfant et à identifier les facteurs pouvant influencer cette faisabilité. Nous considérons que cette nouvelle offre de services est faisable dans sa version actuelle, bien qu'elle nécessite encore des ajustements pour mieux répondre aux divers besoins cliniques et assurer sa pérennité.

Nos résultats confirment d'abord l'intérêt déjà documenté des cliniciennes pour la XR : la *Technothèque* a été utilisée en réadaptation, principalement par les professionnelles intervenant auprès de jeunes hospitalisés avec des besoins de renforcement général et rencontrant des enjeux d'engagement en thérapie conventionnelle. Cette utilisation ciblée met en lumière à la fois les forces actuelles du modèle et les lacunes à combler : autant l'expertise que les outils proposés correspondent mieux aux objectifs moteurs qu'à ceux ciblant les fonctions cognitives ou les troubles de la parole. En particulier, la *Technothèque* semble offrir une réponse prometteuse au défi de l'engagement des adolescents dans leurs activités thérapeutiques.

Les cliniciennes ont rapporté une satisfaction élevée, suggérant que la *Technothèque* constitue un modèle acceptable et bien adapté au contexte pédiatrique. Le rôle du courtier de connaissances apparaît central, tant pour soutenir l'apprentissage que pour optimiser le temps clinique. Toutefois, les perceptions de la pertinence et de l'adéquation de la XR varient selon l'expérience des professionnelles. Nous anticipons que ces perceptions évolueront à mesure que les cliniciennes s'approprieront les outils de XR.

Malgré les fondements du modèle de la *Technothèque* qui visent à réduire les barrières déjà identifiées dans la littérature, certaines cliniciennes ont tout de même rapporté un manque de temps et de connaissances. Dans un centre vaste et structuré en plusieurs programmes, quatre mois ne suffisent pas à mobiliser l'ensemble du personnel, surtout dans un protocole de participation volontaire.

En somme, ce mémoire met en lumière les enjeux liés à l'adoption de la XR en réadaptation pédiatrique et propose une compréhension actualisée de ces défis. Cette étude constitue la première évaluation de faisabilité d'un nouveau modèle de service en santé, révélant des pistes d'amélioration concrètes pour soutenir l'évolution et la pérennisation de la *Technothèque*.

ANNEXE A

Technologies et matériels disponibles dans la *Technothèque*, Hiver-Printemps 2024

Hardware		Game Title	Game-Player Interaction	Non-custom/ Custom
Laptop	Kinect v2.0	Jintronix	Motion tracking (Camera)	Custom
	-	Ludofit		
	Makey Makey board Alligator clips Conductive pencils Conductive tape	Makey Makey	Hand to conductive object	Non-custom
Meta Quest 3		Astro Surfeur	Head-mounted display (immersive) Motion tracking (Controllers)	Custom
		Dance Central		Non-custom
		First Encounters		
		Power Beats		
		Sports Scramble		
		Vacation Simulator		
Nintendo Switch	Joy-Con	Just Dance 2022	Motion tracking (Controllers)	Non-custom
	Nintendo Switch's Tennis racket	Mario Tennis Aces		
	Ring-Con Leg strap	Ring Fit Adventure		
	Joy-Con	Sports		
Nintendo Wii	Wii Controller Wii Nunchuk Wii Balance Board	Wii Fit +	Pressure sensors (Balance Board) Hand-held Controllers	Non-custom
		Wii Sports		
		Wii Ski and Snowboard		
	Wii Controller Wii Wheel	Wii Mario Kart	Hand-held Controllers	
Orbbec Persee		Bootle Blast	Motion tracking (Camera)	Custom
Tablet or iPad	Osmo base Osmo reflector Osmo accessories	Coding with Awbie	Digital game with physical game pieces	Non-custom
		Coding Jam		
		Numbers		
		Creative Starter Kit		
		Little Genius		
		Pizza Co.		
Xbox One	Kinect v2.0	Fruit Ninja	Motion tracking (Camera)	Non-custom
		Kinect Rivals Sports		
		Lego		Non-custom

	Xbox Adaptive Controller	Sonic Mania	Custom buttons and joystick	
Xbox 360	Kinect v1.0	Just Dance	Motion tracking (Camera)	Non-custom
		Kinect Adventures!		
		Motion Sports		
		Wipe Out 3		

Other materials available to clinicians in the *Technotheque* – Winter-Spring 2024		
Material Type	**Material**	
Resistance and balance training tools	Ankle weights (2x 5 lbs), (4x 3lbs)	Wrist weights (3x 1lbs), (1x 0.5lbs)
	Dumbbell (2x 2lbs), (2x 3lbs), (2x 5lbs)	Resistance bands (1x easy, 1x medium, 1x hard)
	Balance board (1x)	Bosu (1x)
	Exercise Ball (1x small, 2x medium, 1x large)	Walking sticks (2x)
	Yoga mat (1x)	Thick exercise mat (1x)
Furniture	Table (1x)	Electric height-adjustable desk (1x)
	Height adjustable side table (1x)	Office chairs (2x)
	Chair on wheels (4x)	Chair no wheel (1x)
	Child's chair (2x)	
Desk supplies	Pens, colouring pens, markers	Duck tape, removable tape
	Adhesive putty	Scissors
	Paper	
Miscellaneous	SMARTMAX magnetic set (1x)	Wooden blocks set (1x)
	Abacus (1x)	Soccer ball, dodgeball (1x)

ANNEXE B

Questionnaire de satisfaction basé sur le CFIR

Date : ________________________
Numéro d'identification du clinicien participant : ________________________

Nous aimerions connaître votre appréciation de la *Technothèque* en tant que **local de travail** et en tant qu'**offre de service de soutien** (on ne parle pas des jeux spécifiques). Vos réponses aux questions suivantes nous aideront à bonifier notre offre de service et à mieux répondre aux besoins des cliniciens et patients du CRME.

Technothèque : Contexte général

Cette section réfère à **l'utilisation de la *Technothèque* en tant que local de travail**.

1. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Avec certains clients, je vois un avantage relatif à utiliser la RV plutôt qu'une autre activité pour atteindre les objectifs de ma séance.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. En général, les séances dans la *Technothèque* peuvent facilement s'adapter à mes besoins et à ceux de mes clients.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

c. Je trouve que le système de contrôle de la *Technothèque* est facile à utiliser (ex. allumer/éteindre les écrans, projeter l'image des consoles).

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

d. Je connais bien l'ensemble des différents jeux disponibles dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

e. Je sais comment obtenir de l'information ou de l'aide pour utiliser la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

Cette section réfère à **l'utilisation des consoles et systèmes disponibles dans la *Technothèque***.

2. Selon votre perspective, quel est le niveau de difficulté à utiliser chacun des systèmes de la *Technothèque*?

BootleBlast	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Jintronix	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Ludofit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Nintendo Switch	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Nintendo Wii	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Oculus Quest	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Osmo (tablette)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Xbox 1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**
Xbox 360	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**

Légende :

1= Très difficile, 4= Moyennement difficile, 7= Très facile, N/A= Vous n'avez jamais utilisé ce système.

Cette section réfère à **l'offre de service de formation et de consultation dans la *Technothèque***.

3. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. J'ai fait confiance à l'équipe de soutien pour m'offrir de la formation de qualité.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. J'ai vu un avantage relatif à suivre une formation donnée par l'équipe de soutien plutôt qu'apprendre à utiliser la *Technothèque* par moi-même.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

c. Les options de formation et de consultation disponibles étaient bien adaptées à mes besoins.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

d. J'ai eu l'occasion d'essayer la *Technothèque* et de tester les jeux avant de les utiliser pendant une séance avec un client.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

e. Je connais les différentes options de formation / de consultation qui sont disponibles.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

f. Le temps que j'aie passé en formation dans la *Technothèque* était adéquatement rémunéré.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

g. Avez-vous d'autres commentaires ou suggestions à nous partager à propose de l'offre de service de formation et de consultation dans la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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Contexte interne

Cette section réfère aux **infrastructures** dans la *Technothèque*.

4. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Le local de la *Technothèque* est assez accessible pour y amener mes clients.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. Les heures d'ouverture de la *Technothèque* sont suffisantes pour que je puisse y aller pendant mes heures de travail.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

c. La *Technothèque* est à une distance raisonnable pour que je puisse m'y rendre dans le cadre de mes activités professionnelles.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

d. Avez-vous d'autres commentaires ou suggestions à nous partager à propos de l'infrastructure de la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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Cette section réfère **aux technologies de l'information et des communications** de la *Technothèque*.

5. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Je trouve que le système de réservation de la *Technothèque* est pratique.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

☐ N/A, je n'ai jamais réservé la *Technothèque*.

b. Lorsque nécessaire, j'ai pu entrer en contact avec le personnel de soutien dans des délais raisonnables.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

☐ N/A, je n'ai jamais essayé de contacter l'équipe de soutien pour obtenir de l'aide.

c. Avez-vous d'autres commentaires ou suggestions à nous partager à propos des technologies de l'information et des communications de la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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____

Cette section réfère aux **tâches quotidiennes** associées à l'utilisation de la *Technothèque*.

6. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. La plupart du temps, j'arrive à remplir les formulaires suivants (Objectifs de la séance, Formulaire de rétroaction) dans des délais raisonnables, sans trop perturber mes activités professionnelles.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. Avez-vous d'autres commentaires ou suggestions à nous partager à propos des tâches quotidiennes associées à la l'utilisation de la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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Cette section réfère au développement d'un réseau **interpersonnel** en lien avec l'utilisation de la *Technothèque*.

7. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Il m’arrive régulièrement de parler de mon expérience dans la *Technothèque* à mes collègues (environ 1x/semaine).

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

b. Avec mes collègues, il nous arrive d’échanger des trucs et astuces en lien avec l’utilisation de la *Technothèque* en pratique clinique.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

☐ N/A, aucun de mes collègues utilise la *Technothèque*.

c. L’offre de service de formation / consultation m’a permis d’élargir mon réseau professionnel (ex. collaborer avec d’autres cliniciens, échanger avec des gens qui ont une expertise différente de la mienne).

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

d. Avez-vous d’autres commentaires ou suggestions à nous partager à propos d’un réseau interpersonnel lié à la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l’entretien individuel.

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Cette section réfère à la **culture et au climat de travail** en lien avec l’utilisation de la *Technothèque*.

8. Dans quelle mesure êtes-vous d’accord avec les énoncés suivants :

a. Dans le cadre de mes activités en lien avec la *Technothèque*, mon expérience professionnelle est respectée.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

b. Les initiatives qui proviennent de la *Technothèque* priorisent les besoins des employés du CRME.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

c. Les initiatives qui proviennent de la *Technothèque* priorisent les besoins des clients du CRME (enfants).

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

d. Le personnel de soutien de la *Technothèque* est ouvert à mes suggestions, à mes questions et à mes commentaires.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d’accord

e. En séance de formation ou de consultation dans la *Technothèque*, je sens que j'ai le droit à l'erreur.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

f. Lorsque j'utilise la *Technothèque*, je ressens de la pression (stress) liée à mes actions et à mes décisions en tant que travailleur.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

g. Les services offerts par la *Technothèque* me permettent de pleinement m'approprier la salle pour l'utiliser selon mes besoins.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

h. Avez-vous d'autres commentaires ou suggestions à nous partager à propos de la culture et du climat de travail dans la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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Cette section réfère à **l'équipement et aux ressources matérielles** disponibles dans la *Technothèque*.

9. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Il y a suffisamment de matériel disponible dans la *Technothèque* pour répondre à mes besoins (ex. poids libres, tapis, ballons, etc.).

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. Auriez-vous des suggestions de matériel à nous proposer?

c. Il y a suffisamment de jeux / consoles disponibles pour répondre à mes besoins.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

d. Auriez-vous des suggestions de jeux ou de types de jeux à nous proposer?

e. J'ai souvent eu des problèmes techniques dans la *Technothèque*.

1	2	3	4	5	6	7

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1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

f. Veuillez estimer le nombre de fois où vous avez rencontrés des problèmes d'ordre technique dans la *Technothèque* :

____

g. Veuillez indiquer la nature des problèmes techniques rencontrés :
   i. **Options** :
      1. N/A, je n'ai jamais rencontré de problème technique
      2. Difficulté à me connecter à internet
      3. Difficulté à allumer une console de jeu
      4. Difficulté à utiliser le système de contrôle centralisé (ex. projection des consoles sur les écrans)
      5. Autre (préciser : ____)

h. Avez-vous d'autres commentaires ou suggestions à nous partager à propos de **l'équipement et des ressources matérielles disponibles** dans la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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Cette section réfère **aux services de formation** de la *Technothèque*.

10. À votre avis, quelles seraient les activités de formation les plus pertinentes pour apprendre à utiliser la *Technothèque*?

a. Veuillez placer les options présentées par ordre de priorité) :

Légende : 1= Mon option préférée, 6= L'option que j'aime le moins

- Pratique en 1 : 1 <u>sans</u> client (avec le personnel de soutien de la *Technothèque*)
- Pratique en 1 : 1 <u>avec</u> client (avec le personnel de soutien de la *Technothèque*)
- Formation de groupe menée par le personnel de soutien de la *Technothèque*
- Formation de groupe menée par d'autres cliniciens expérimentés
- Manuel de protocole clinique
- Vidéo en ligne sur un site web

b. Avez-vous d'autres commentaires ou suggestions à nous partager à propos **des services de formation offerts** dans la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

Caractéristiques individuelles

Cette section réfère aux **caractéristiques individuelles** qui peuvent influencer votre utilisation de la *Technothèque*.

11. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. J'ai besoin d'utiliser les jeux vidéo et la réalité virtuelle pour accomplir une partie de mes activités professionnelles.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. J'ai besoin du personnel de soutien pour apprendre à utiliser les jeux vidéo et la réalité virtuelle dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

c. Je me sens compétent.e lorsque je travaille dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

☐ N/A, je n'ai jamais travaillé dans la *Technothèque*.

d. Au cours de ce projet, j'étais motivé à apprendre à utiliser les jeux vidéo et la réalité virtuelle dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

e. Avez-vous d'autres commentaires à nous partager à propos **des caractéristiques individuelles qui peuvent influencer votre utilisation** de la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

Contexte d'implémentation

Cette section réfère **au contexte clinique** qui peut influencer les services offerts et l'utilisation de la *Technothèque*.

12. Au total, combien d'heures de formation (avec et/ou sans client) avez-vous reçu dans le cadre de ce projet?

☐ 1 heure
☐ 2-4 heures
☐ 5-7 heures
☐ 8-9 heures
☐ 10 heures
☐ Plus de 10 heures

13. Approximativement, quel est le pourcentage de clients avec qui vous avez utilisé la *Technothèque* depuis le début de votre participation à cette étude? (Clients amenés dans la *Technothèque* / Nombre de clients total)

____

14. Dans quelle mesure êtes-vous d'accord avec les énoncés suivants :

a. Sur la base de l'expérience acquise au cours de ce projet, je suis confiant.e en mes capacités dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

b. J'aurai encore besoin d'assistance technique pour installer et éteindre les consoles lors de mes prochaines séances de thérapie dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

c. J'aurai encore besoin d'assistance pour sélectionner les jeux pertinents pour mes clients lors de mes prochaines séances dans la *Technothèque*.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

d. Si elle existait, j'utiliserais une application et/ou un site web pour orienter mes décisions afin de sélectionner des jeux pertinents selon le profil de mes patients.

1	2	3	4	5	6	7

1= Fortement en désaccord 4=Neutre 7= Fortement d'accord

15. Dans le futur, je crois que les obstacles qui pourraient nuire à mon utilisation de la *Technothèque* sont les suivants (sélectionner toutes les options applicables) :

☐ Je manquerai de temps pour apprendre à utiliser la *Technothèque* de manière autonome.
☐ Je manquerai de temps pour me rendre à la *Technothèque* et m'installer pour une séance.
☐ Les jeux disponibles ne répondront pas aux besoins de mes clients.

- ☐ Je dois prioriser d'autres types d'objectifs (ex. alimentation) hors de la *Technothèque*.
- ☐ Je n'ai pas d'intérêt personnel à utiliser la salle.
- ☐ Mes clients ne seront pas motivés à participer aux jeux de la *Technothèque*.
- ☐ Je rencontrerai des problèmes liés à la technologie.
- ☐ Je serai mal à l'aise d'utiliser la RV lors de mes séances de thérapie.
- ☐ J'aurai de la difficulté à réserver la salle.
- ☐ J'aurai de la difficulté à obtenir de l'assistance technique de qualité.
- ☐ Autre (préciser) : ____

16. À l'avenir, j'estime utiliser la *Technothèque* avec X% de mes clients :

- ☐ 0%
- ☐ Moins de 10%
- ☐ 10-24%
- ☐ 25-49%
- ☐ 50-74%
- ☐ Plus de 75%

17. Avez-vous d'autres commentaires à nous partager à propos **du contexte clinique** qui peut influencer les services offerts et l'utilisation de la *Technothèque*? Au besoin, vous pourrez élaborer sur ce point lors de l'entretien individuel.

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FIN

Merci d'avoir pris le temps de répondre à ce questionnaire, votre participation est très appréciée!

ANNEXE C

Guide d'entretien semi-dirigé

Tout d'abord, je tiens à vous remercier d'avoir accepté de participer à cet entretien sur votre implication dans la *Technothèque* au cours de ce projet. Nous aimerions connaître votre point de vue de cette expérience afin de pouvoir améliorer notre offre de service et mieux répondre aux besoins des cliniciens et des patients. Votre perspective informera également les connaissances scientifiques sur l'utilisation de la réalité virtuelle en réadaptation pédiatrique.

Afin de pouvoir analyser les données, nous aimerions faire un enregistrement audio de cet entretien. Une fois l'enregistrement terminé, un membre de l'équipe de recherche fera une transcription de cet enregistrement et le fichier audio sera détruit. La transcription sera conservée sur un serveur sécurisé. Acceptez-vous d'être enregistré par audio?

L'entretien comporte environ 12 questions et devrait prendre environ 20-25 minutes de votre temps. Avez-vous des questions avant de commencer?

1. Pouvez-vous résumer votre utilisation de la *Technothèque* au cours de ce projet de recherche?

2. Quelles sont vos impressions de cette expérience?

   a. Qu'avez-vous aimé de votre expérience? Pouvez-vous me raconter un exemple précis?

   b. Qu'est-ce que vous n'avez pas aimé de votre expérience? Pouvez-vous me raconter un exemple précis?

3. De votre point de vue, avec son fonctionnement actuel, en quoi la *Technothèque* est-elle utile à la pratique clinique?

4. À votre avis, y a-t-il certains types de profils de jeune(s) pour qui la *Technothèque* serait particulièrement pertinente? Des exemples pourraient être des enfants d'un certain âge, certaines incapacités physiques/cognitives, un trait de personnalité ou des intérêts particuliers, etc.

a. À l'opposé, y a-t-il certains types de profils de jeune(s) pour qui la *Technothèque* ne serait absolument pas pertinente?

5. **(Pour cliniciens en réadaptation physique, si applicable)** Quel jeu était particulièrement utile lors de vos séances de thérapie avec un patient? Pourquoi?

6. **(Si applicable)** Quel jeu avez-vous particulièrement apprécié pour solliciter la participation sociale et/ou le plaisir? Pourquoi?
7. **(Si applicable)** Qu'avez-vous pensé de l'offre de service de formation privée de la *Technothèque*?
   a. Auriez-vous des suggestions d'amélioration à nous proposer?
8. Qu'avez-vous pensé de l'offre de service de soutien avec un client?
   a. Auriez-vous des suggestions d'amélioration à nous proposer?
9. Avez-vous des suggestions de matériel physique que nous devrions nous procurer pour soutenir vos activités dans la *Technothèque*?
10. Avez-vous des suggestions de jeux ou de types de jeux que nous devrions nous procurer pour mieux répondre à vos besoins?
    a. Si 'tout était possible', qu'est-ce que vous aimeriez pouvoir faire avec les jeux vidéo dans la *Technothèque*?
11. À votre avis, quelles sont les prochaines activités prioritaires qui devraient être organisées par la *Technothèque*? *Des exemples pourraient être : des activités de formation en groupe, le développement de nouveaux jeux, l'amélioration de nos services actuels, des activités de loisir, etc.*
12. Avez-vous d'autre information que vous aimeriez nous partager?

FIN

Merci d'avoir pris le temps de participer à cet entretien!

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