

Fat(s), Muscle(s), Movement, and Physiologies in Early Childhood Education

by

Nicole Land

B.Sc., University of Alberta, 2011

M.A., University of Victoria, 2014

A Dissertation Submitted in Partial Fulfillment of the
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DOCTOR OF PHILOSOPHY

in the School of Child & Youth Care

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Supervisory Committee

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Dr. Veronica Pacini-Ketchabaw, Supervisor
School of Child and Youth Care

Dr. Sandrina de Finney, Departmental Member
School of Child and Youth Care

Dr. Mindy Blaise, Outside Member
College of Arts and Education
Victoria University

Abstract

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School of Child and Youth Care

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Dr. Mindy Blaise, Outside Member
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Victoria University

Abstract

Euro-Western early childhood education physical activity curriculum foregrounds practices of physical literacy, childhood obesity prevention, and normative health promotion. Arguing that these pedagogical frameworks delimit how children and educators can engage with bodies in early childhood education, this dissertation utilizes documentation from pedagogical research with children and educators to think *with* fat(s), muscle(s), movement, and physiological knowledges. I contend that Euro-Western physical activity pedagogies define and obscure the physiological knowledges that sustain the epistemic authority these pedagogies hold and thus curate how early childhood education research and practice can mobilize physiological knowledges. In this dissertation, I integrate feminist science studies, post-developmental pedagogies, and post-qualitative education research to argue that early childhood education can generatively engage (with) physiological knowledges while attending to how fat(s), muscle(s), and movement matter amid intentional and situated pedagogical practices.

Drawing upon a pedagogical inquiry project focused on movement with preschool and toddler-aged children and educators, this dissertation details how fat(s), muscle(s), movement,

and physiological knowledges were encountered, foregrounded, questioned, and complexified in one child care center in Canada. Throughout the four articles that comprise this project, I position Physiological Sciences as a settler colonial epistemological structure that is highly consequential for early childhood education. I argue that because I am a white settler trained in the conventions of Physiological Sciences, I am complicit in this knowledge system and must work to unsettle the epistemic authority Physiology exerts in education. The articles present four interventions that aim to confront predominant Euro-Western practices for thinking with Physiology in early childhood education research and pedagogy.

In the first article, I situate my project within post-qualitative education research, asserting that post-qualitative research can mobilize physiological knowledges with non-essentialist, answerable methodological practices. The second article elaborates two pedagogical propositions aimed at taking physiological knowledges to account with post-developmental early childhood education pedagogies. I focus on how muscle(s) mattered in our pedagogical inquiry with children and educators in Article 3 and outline ‘muscling’ as the ongoing work of thinking muscles with pedagogies. Finally, in Article 4 I explore how thinking with post-developmental fat(s) might reconfigure existing educational entanglements with fat(s) through tentative, risky, uncertain, and situated pedagogical practices of making and relating with fat(s). Together, the four articles contribute to ongoing conversations in early childhood education concerned with how pedagogies might complexify predominant Euro-Western scientific knowledge systems, take seriously the materialities of flesh, and generate alternatives to neoliberal health and fitness-oriented programming in early childhood education in Canada.

Keywords: *post-developmental pedagogies, early childhood education, fat, muscles,*

movement

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Introduction. Rethinking Fat(s), Muscle(s), Movement, and Physiologies in Early Childhood Education

As I begin this introduction to my research, I trace how my project has evolved to think with fat(s), muscle(s), movement, physiologies, and early childhood education pedagogies. While I initiated this research hoping to consider how fat matters in Canadian early childhood education, I have expanded my attention to how fat(s), muscle(s), movement, and physiologies become entangled with pedagogies. The knots of bodied materiality and physiological knowledges that have interjected in my writing, and with/in the early childhood education pedagogical research¹ that informs this work, anchor the ethic that I, as a white settler, bring to my dissertation. Taken together, the situated entanglements of fat(s), muscle(s), movement, pedagogies, and physiologies that have come to animate my research, as well as the partial and tentative politics and ethics that I work toward, articulate the conceptual backbone that my dissertation is built upon and that I grapple with throughout the project.

In this introduction, I open by detailing how my focus on fat(s) extended to thinking with muscle(s), then stretched into an attention to movement, and constantly returned to a consideration of how physiologies and pedagogies intertwine. Positioning my continual return to physiological knowledges as a power-laden privilege amid the Euro-Western knowledge hegemonies that reign in Canadian early childhood education, I translate my familiarity with Physiology into questions of how I might be accountable for how I perpetuate, am complicit in, and contribute to unsettling the epistemic power that Physiological Sciences hold. I use this

¹ This dissertation draws on research that is part of an ongoing pedagogical research project with children and early childhood educators. In a later section, titled 'Pedagogical Inquiry Work', I define pedagogical inquiry, explain who participates in inquiry work, outline how documentation is gathered and engaged in our work, explain our use of 'provocations', and detail the role of a pedagogical facilitator.

discussion to frame the precise political and ethical accountabilities of my work as a series of situated, ongoing, slippery, and necessary tensions that I wrestle with throughout the dissertation. After outlining the central intentions and structure of the dissertation, I conclude by describing the research site and the pedagogical inquiry practices utilized in this research, before segueing into my first article.

Fat(s) + Muscle(s) + Movement (and always Physiologies)

When I initially conceptualized this research project, I was set on complexifying how fat matters in early childhood education. I had recently completed an internship with a childhood obesity organization and after spending the first eight months of my doctoral courses researching childhood obesity histories and politics in Canada, I was very concerned with how existing pedagogies and curricula centered ‘childhood obesity’ as a preeminent concern in early childhood education. As a kinesiology graduate, I worried that this relentless focus on ‘obesity’ delimited children’s possibilities for understanding or relating with fat. With every exercise guideline, evidence-based health promotion intervention, and ‘healthy’ snack I met, I felt increasingly certain that proliferating, not restraining, our possibilities for engaging differently with fat in Euro-Western early education was an incredibly urgent project.

As my research proceeded, educators, children, and researchers, including myself and two other pedagogical facilitators, began a pedagogical inquiry project² focused on movement in early childhood education. We conceptualized our muscles as tools of pedagogy and used our bodies to explore how, where, and why movement happened in the child care center space.

² Within the overarching pedagogical research with children and educators that informs this dissertation, we often engage in ‘inquiries’ which are targeted projects that take up precise interests or curiosities that children, educators, or researchers share. In the ‘Pedagogical Inquiry Work’ section later in this Introduction, I describe two specific pedagogical inquiries that I draw on throughout the articles.

During this inquiry, I started my first candidacy paper (Land, 2017). I wrote with physiological knowledges to explore how different fat(s) might be infiltrated, disrupted, or re-deployed to re-imagine the possibilities for engaging with fat(s) in early childhood education. I understood this paper as a foundation for my dissertation, where I would tend carefully to Physiology before beginning my research but then turn toward pedagogy when writing my dissertation. As our pedagogical inquiry evolved, educators, children, and researchers noticed how challenging it was to do movement while intentionally using only our bodied resources: our muscles, our tendons, our metabolisms. Moving our bodies without the familiar material crutches used in typical movement-promoting pedagogies, including balls or balance blocks, surprised me with its demands for inventiveness, risk, and vulnerability. My notes from this inquiry shift toward wondering flesh and/in motion, and I added ‘muscles’ and ‘movement’ to my research questions about fat.

When I began my second candidacy paper (Land, manuscript in preparation), I was determined to think muscles and movement with fat. I could no longer appreciate obesity interventions, exercise prescriptions, or fat without muscles and muscles mattered with moving. I was confident that I could build my project from a critique of how foundational physical education/movement resources, such as physical literacy or obesity-prevention programs, become entangled with neoliberal governance and Euro-Western dictates of normative development. I started thinking with the ‘body bridges’ that constantly emerged in our movement inquiry, as children pushed the soles of their feet backward against walls and lifted their chests upward with their biceps. I tugged at the incongruities between body bridging and descriptions of balance or prescriptions for active play as dictated in dominant resources, and found my analysis dull. No, exercise guidelines do not capture the complexities of movement we met in our inquiry.

Yes, guidelines are tools of governance rooted in larger narratives of citizenship and health (Azzarito, 2009; Land & Danis, 2016; LeBesco, 2011). But then, a question remained: how do I craft generative and relevant pedagogical questions from within this messy lack? What endures – what matters – that might be re-inhabited to move differently with fat(s) and muscle(s)?

I poured over my favourite Anatomy and Physiology textbooks in hopes that they might provide some direction. I told myself that this was only to become unstuck. I wanted to think about early childhood education pedagogy, not about Science. After trying many different entry points and becoming stalled, I created my second candidacy paper by thinking with actin and myosin, the proteins that enact muscular contraction. I argued that my research would explore how pedagogies might do (with) muscles. I was positive that this focus on ‘doing’ muscles would draw me away from Physiology and (finally) help me focus on pedagogical interests.

A few months later, my pedagogical facilitator colleagues and I began a new season of collaborating with educators and children. As part of an annual research mobilization festival at our university, we created a studio-exhibit that detailed our pedagogical inquiry work with movement. The studio-exhibit entailed a strong critique of physical literacy practices, as we responded to questions of what gets defined as movement, how movement is lived, and what movement can do. I could follow the studio-exhibit’s connections with our ongoing inquiry work and I was energized by how our documentation (the educators’ narrations, digitally overlaying images, pausing complex moments in multiple still images) offered a rich, tense, and messy illustration of what dominant physical literacy and physical activity pedagogical resources must minimize, obscure, or ignore. However, I felt unsettled about how, or if, the studio-exhibit might be in conversation with my dissertation research – (how) might our studio-exhibit attend to how fat and muscles move, matter, and happen in early childhood education?

As I wrote my dissertation, members of my committee tugged at tensions that made clear how my work is entangled with Physiology. Dr. Sandrina de Finney posed questions of what I create and intend when I use the words ‘political’ and ‘ethical’. Dr. de Finney asked me to consider whose politics I choose to engage or silence when I put forward fat(s) and muscle(s) as ‘political’ and ‘physiological’ concerns, especially when I position my work as a confrontation with/in ongoing settler colonialism. Dr. Stephanie Springgay, who provided invaluable feedback on my candidacy papers and early drafts of this dissertation, suggested that I consider what integrating pedagogical inquiry with feminist science studies and post-qualitative education research might require methodologically and theoretically. I understood this as a reminder to survey the philosophical and ethical lineages I owe to and elaborate how I am differently loyal and accountable to Physiology at different points in my project. Dr. Mindy Blaise raised questions related to the settler politics that I enact throughout the project. Dr. Blaise challenged me to carefully articulate how my situated, partial intentions for engaging with physiologies inform how I might act with – do – physiologies with post-developmental pedagogies.

I began to wonder if there might be something to the continual interjections of Physiological Sciences in my work: maybe thinking pedagogically with fats, muscles, and movement, for me (in this project, in this city, with these children and educators) demands that I also confront physiological knowledges. How can I articulate how ‘politics’ happens in this dissertation without confronting the imperfect settler colonial and consequential Physiological loyalties that animate my theorizing? How can I write with materiality and muscles, or methodology and pedagogy, without carefully tuning to the ontological and ethical tensions of thinking Science with post-developmental early childhood education pedagogies? I started to wonder if confronting physiological knowledges might mark the contribution that my project can

make toward thinking with fat(s), muscle(s), and movement pedagogically: how might I engage in differently answerable and accountable practices of, and relationships with, fat(s), muscle(s), movement, and physiologies in early childhood education?

Doing Politics with Physiologies and Pedagogies

Physiological Sciences have come to matter, alongside fat(s), muscle(s), and movement, as layers of intentional concern in my research. Importantly, I foreground the specific ethical and political demands of thinking physiological knowledges with pedagogies in Canadian early childhood education. Situated in ongoing settler colonial power relations³ in contemporary Canada, Euro-Western knowledges and the neoliberal imperatives they perpetuate are afforded overwhelming influence in mainstream early childhood education policy, curriculum, and pedagogy (Pacini-Ketchabaw, 2013; Pacini-Ketchabaw & Nxumalo, 2014; Pacini-Ketchabaw,

³ In contemporary Canada – where ‘Canada’ is a contested settler construction for the geopolitical space this country occupies – settler colonial power relations refer to the structural inequities that pervade Canadian social systems and continually perpetuate hierarchies that minoritize non-White communities and people (de Finney, Dean, Loiselle, & Saraceno, 2011; Hunt, 2015; Simpson, 2014; Todd, 2016). Canada, as an actively settler colonial state, is founded upon the ongoing occupation of land stolen by Euro-Western settlers from Indigenous peoples. As Tuck and Gaztambide-Fernández (2013) detail, settler colonial power relations are built of and perpetuate “the specific formation of colonialism in which the colonizer comes to stay, making himself the sovereign, and the arbiter of citizenship, civility, and knowing” (p. 73). Tuck and Yang (2012) detail how this assumed Euro-Western settler authority proceeds by continually occupying and consuming Indigenous land, such that Indigenous cosmologies that depend upon relationships to land can be disrupted and Indigenous people can be forcefully displaced. Settler epistemologies, ontologies, and bodies then occupy these territories and assert Euro-Western structures of governance, knowledge, and control – which enact Euro-Western land politics which require that Indigenous peoples are devalued by dominant structures which further bolsters the structural inequities that maintain white settler privilege. de Finney et al. (2011) make clear that these dominant settler structures actively perpetuate settler colonial power relations, as Canada “continues to rely on the subjugation and relocation of entire Indigenous societies, which sustain a system of chronic poverty, social exclusion, and political and cultural disenfranchisement” (p. 363). When I refer to settler colonial structures or Euro-Western knowledges in this dissertation, I am speaking of the urgently present systems and practices that allow for settlers to remain on stolen land because of ongoing colonizing relationships that enact violence against Indigenous (and other racialized or minoritized) people.

Nxumalo, & Rowan, 2014). Concurrently, Scientific discourses, including Physiology, serve as a powerful method of Euro-Western knowledge production (Roy & Subramaniam, 2016; TallBear, 2013; Whitt, 2009; Willey, 2016). Physiological Science, therefore, exerts epistemic power amid the settler colonial knowledge hegemonies that infiltrate early childhood education.

As a fourth-generation white settler who has been trained in the language and conventions of Physiology, my consideration of how physiologies are entangled with pedagogies is situated amidst Euro-Western knowledge structures. I am privileged to access the Physiological Sciences canon, and this privilege is partially enabled by the epistemic conventions of Science that quite literally allow for, and sustain, my presence and power as a settler on Esquimalt, Lekwungen, and WSÁNEĆ territories. Thinking Physiology with early childhood education pedagogies is therefore, as I argue throughout this dissertation, a more-than-procedural proposition. Questions of how I, as a white settler, might become answerable and accountable to the knowledges I use, craft, and share within the settler colonial knowledge hegemonies that govern early childhood education are central to this project.

I build my understanding of how my research might do ‘politics’ from Willey’s (2016) assertion that “when we claim sciences, instead of ‘engaging’ them, the terrain shifts from one of how un/friendly feminists are to Science to one of what a world of sciences has to offer, where so much is at stake” (p. 146). Borrowing from Willey, *claiming* Physiology entails acknowledging my complicity in this dominant apparatus, understanding my privileged access as an accountability to the lived effects of Physiology, and recognizing that intervening in the epistemic power of Scientific discourse needs to be a non-exclusionary project taken on by settlers who benefit from this system. In a Canadian context, I hear Willey call for settlers to stick with the Euro-Western knowledge systems we created and work to become accountable to

the consequences these knowledges enact on other bodies and knowledges by hammering away at the epistemic authority that Sciences assume. Willey, in my understanding, is arguing that settlers do not get to develop ‘new’ methodologies or pedagogies with ‘new’ theoretical resources while claiming to provide ‘new’ ontological frameworks – where, as Todd (2016) outlines, this ‘new’ brands appropriation of Indigenous and non-Euro-Western ontologies as innovation. Rather, as a settler, I am accountable for dismantling, as best I can, Euro-Western knowledges that perpetuate violent epistemic control in service of neoliberal governance. Infiltrating Sciences’ messes, supremacy, and vulnerabilities is a project that Euro-Western settlers should actively seek to undertake – without, as I elaborate later, wholly dictating.

‘Claiming’ Physiology assumes that as a settler, I can interfere with settler colonial knowledge systems that sustain the ontological structures that allow for my body to live on occupied land, that make it possible for me to write these words in this language, and that perpetuate practices of knowledge generation and proliferation that I am familiar with. Such an assumption is fraught: from Tweetstorms by Indigenous scholars Billy-Ray Belcourt (@BillyRayB), Eve Tuck (@tuckeve), Zoe Todd (@ZoeSTodd), and Chelsea Vowel (@apihtawikosisan), I know that settlers can never entirely unsettle the structures that allow for our continued presence on occupied lands. I need to hold the firm limitations of any settler intervention into settler colonial systems – as detailed in everyday digital labour by Belcourt, Tuck, Todd, Vowel and in multiple other forms by many Indigenous people – at the forefront of my work, and thread these borders of my project with Willey’s (2016) call for ‘claiming’. I have to believe that settlers can work to be accountable to our epistemic systems, while knowing this is a contested proposition. I have to believe that this answerability is not only possible, but necessary *and* necessarily inadequate. I, as a white settler literate in Euro-Western Scientific

frameworks, must work to claim and disrupt Physiological knowledge hegemonies as best I know how, while recognizing the limited scope of any intervention I might enact.

Roy and Subramaniam (2016) argue that any use of problematic Euro-Western knowledges must be accompanied by the question “why pay attention to this particular knowledge and why return to this particular body of scientific scholarship now?” (p. 34). While I build a partial response to this question based upon Willey’s (2016) call for settlers to claim and intervene in the Scientific knowledges we benefit from, this answer is far from adequate because I quite honestly do not know how far the bounded intervention this dissertation puts forward will go in upsetting Physiology’s power. Roy and Subramaniam teach me that, to begin with, I need to be answerable to the power-laden consequences of centering Sciences with pedagogies. To be accountable to Scientific knowledges, I want to claim Physiology *with* the (Euro-Western) feminist science studies, post-developmental pedagogies, and post-qualitative research theories that line up with my (settler) possibilities for action in the (early childhood education) spaces that I inhabit. I know that this is an imperfect and narrow proposition. My tools for interjecting in Physiological Sciences (including the theories listed above) were created as interventions in predominant humanist legacies and perceived Scientific objectivity. These theories are developed (largely) by Euro-Western scholars using Euro-Western knowledges to disrupt Euro-Western academic traditions. The theories that I draw upon have been critiqued as a ‘new’ colonial project (Roy & Subramaniam, 2016; Todd, 2016) because they center Euro-Western scholars, often appropriate and silence Indigenous and non-Euro-Western knowledges, and are readily integrated into the fabric of neoliberal academic inquiry. Because I utilize theories that have been primarily articulated by Euro-Western scholars, and because I am a settler, there are a

multitude of critical and lived interventions, and different ontologies carried by Indigenous and non-Euro-Western activists and scholars, that I do not, and cannot, access in this project.

I do not claim this project to be decolonial simply because it explicitly engages a colonial knowledge (Physiology). I approach Physiology as a settler colonial knowledge, because the physiological knowledges that I know adapt to meet the neoliberal-governmental demands of Euro-Western Canada and because I recognize Willey's (2016) call to 'claim' Sciences through my positionality as a settler. My project does not reconfigure how settler bodies and knowledges inhabit the stolen land and territories where my research and writing take place – I know that there is deep privilege, and irony, in situating Physiology as a settler colonial knowledge and then doing little to address how my muscle, fat, and skin literally continues to occupy Esquimalt, Lekwungen, and WSÁNEĆ territories. This is a limitation of my dissertation that I want to make public.

I think this project as a form of settler interference with/in a settler colonial knowledge system; a desettling incursion that requires that settlers stick with the knowledge structures we have perpetuated and work to unsettle these. I need physiological knowledges to write into accountability my entanglement with dominant epistemic hegemonies that privilege Scientific ways of knowing flesh. This is the politic I work toward: a politics of dragging a settler colonial knowledge toward an accountability and answerability that I can work for but can never dictate, while knowing that settlers can only unsettle our knowledges to a limited degree. I do not intend to claim that only settlers can intervene in Physiology, but I do contend that settlers are precisely accountable to the colonial epistemological structures we invest in and that sustain our power and presence in contemporary Canada. This politic raises multiple questions that I grapple with throughout my dissertation: (how) can confronting physiological knowledges disrupt colonial

methodological habits or neoliberal education imperatives that privilege Euro-Western epistemologies? How can I craft actionable pedagogical propositions that meaningfully unsettle dominant methods for engaging with fat(s), muscle(s), movement, and physiological knowledges in early childhood education? Is it possible to disrupt Physiology's epistemic hegemony in education while continuing to draw upon its insights or/and am I contributing to the proliferation of colonial knowledge systems?

Doing Ethics with Physiologies and Pedagogies

This politic also informs how I understand the power and limits of my intervention into Physiology. I utilize the terms 'accountability' and 'answerability' to define the ethical framework of my project. I borrow my understanding of these practices from Willey's (2016) contention that settlers should "politicize scientific knowledge production in a way that allows for an answerability, an accountability, beyond the realm of internal critique, that science as we know it lacks" (p. 14). Coupled with Haraway's (2012, 2015) elaboration of response-ability as the demanding, uncertain work of attending to the complexities of situated ethical entanglements, I recognize that 'accountability' and 'answerability' are incremental and imperfect touchstones. From Willey, I know that accountability involves proliferating the resources that I engage Physiology with, such that Physiology is held to account beyond the terms that Scientific discourses set for themselves. With Haraway, I know that answerability is an active, intentional labour; when answerability becomes complacent or convenient, it answers only to the echoes that make it commonplace.

In their critiques of how feminist new materialisms fail to become accountable or answerable beyond the Euro-Western systems they stem from, Roy and Subramaniam (2016) and Todd (2016) have taught me that I do not get to decide if, when, or how thinking

physiologies with pedagogies might achieve any anti-colonial, non-neoliberal epistemic accountability. As a settler, I cannot delineate the parameters for when early childhood education pedagogies might be answerable to the lived consequences they perpetuate for people, knowledges, and bodies that are minoritized within settler colonial structures. What I can do is understand accountability and answerability as an ongoing, constantly negotiated ethic: an ethic of working toward an accountability wherein I will not dictate the counting and an answerability that will require learning what it is to ‘answer’ as a settler. Working physiologies into accountability with pedagogies is not a finite project. ‘Answerable’ is not a determinate criterion. I adopt an ethic of working toward an answerability and accountability that submits my project, and the privileged, powerful knowledges that I am complicit in, to the necessary limitations of any settler intervention into a settler system. I do not know if I can participate in building non-colonizing physiology futures. I certainly do not intend to argue that feminist science studies and post-developmental pedagogies thought by a settler scholar are the best resource for such a project. My answerabilities and accountabilities are necessarily partial.

My use of accountability and answerability as an ethic is also specific to the early childhood education focus of this research. Following de Freitas and Palmer (2016), who refigure ‘force’ as an emergent scientific concept made differently with different pedagogies, I understand that how pedagogies and Sciences become entangled is incredibly consequential. When pedagogies confront scientific knowledges differently – beyond Euro-Western conventions that take Science as an unassailable truth – children and educators become differently positioned, implicated in, and entangled with scientific knowledges (de Freitas, 2016; Palmer, 2010, 2016). In turn, this influences how children and educators (and researchers) can complexify or unsettle scientific knowledges. This means that creating science-pedagogy

entanglements is an intentional and power-laden prospect. Thus, in my project, I aim to generate pedagogies that take physiological knowledges to account to unsettle Physiology's settler colonial epistemic authority *and* I need to be answerable to how physiological knowledges entangle with early childhood education pedagogies in my research.

This ethic generates numerous tensions that thread through my articles: when I utilize Euro-Western knowledges, can I enact the pedagogical answerability I aim toward? What settler accountabilities are possible when I confront physiological knowledges with settler resources built of feminist science studies, post-developmental, or post-qualitative paradigms? How can I extend the pedagogical work described in the articles beyond these pages, such that my propositions can be challenged by different demands for answerability and accountability? How will I work to make this project answerable when it enters into larger scholarly conversations or when it is engaged by scholars, educators, or children who do not subscribe to Euro-Western ways of knowing?

Research Intentions

In the four articles that comprise this dissertation, I think with fat(s), muscle(s), movement, and physiologies as entangled and iteratively co-crafted/ing with early childhood education pedagogies. Consistent with the situated politic and ethic I have detailed, I take up one overarching question throughout my dissertation:

How do physiological knowledges become entangled with fat(s), muscle(s), and movement and early childhood education research/methodologies and pedagogies – and how can knots of methodology, pedagogy, physiological knowledges, flesh, and motion be confronted, disrupted, or extended to generate differently answerable fat(s), muscle(s), movements, physiologies, and pedagogies?

Throughout the articles, I pick this central question up through two specific threads:

1. How might early childhood education research methodologies (*Article 1*) and pedagogies (*Article 2*) take physiological knowledges to account and work to complexify or unsettle the colonial epistemological power ascribed to Physiology in contemporary Canadian education?
2. How might ‘doing’ fat(s) (*Article 4*), muscle(s) (*Article 3*), movement, and physiologies (*Article 2*) with feminist science studies and post-developmental pedagogies shift possibilities for thinking fat(s), muscle(s), movement, and physiological knowledges pedagogically in early childhood education?

Dissertation Structure

This dissertation is comprised of this overall introduction and four articles with a short preface to each article. In the prefaces, I outline my intentions for each article and I make clear the ‘problems’ (or, provocations) that each article confronts. Prefaces describe how each article fits within my larger dissertation project and will not be submitted for publication with the manuscripts. The references for each section are included at the end of the document. My intention behind writing articles, rather than a full-length manuscript, is twofold. First, I understand fat(s), muscle(s), movement, and physiologies in early childhood education to be extremely transdisciplinary concerns, where positioning fat within critical obesity studies or movement within physical education creates institutional and epistemic borders around these materialities and therefore delimits possibilities for engaging differently. To do fat(s), muscle(s), movement, and physiologies with early childhood education pedagogies, I need to speak to multiple audiences: critical obesity, fat studies, and critical public health; physical education and recreation; human physiology, exercise science, and feminist science studies; and post-

developmental and posthuman early childhood education. I intend for each article to converse with a different field, in a mode perceptible to these disciplines, while still engaging fat(s), muscle(s), movement, and physiologies amid the feminist science studies and post-developmental pedagogies footings of my research.

The second reason that I have elected to write articles echoes the ethical commitments of the pedagogical inquiry work that I have been fortunate to participate in with children and educators since 2014. Inquiry work, as built in an ongoing project founded by Dr. Veronica Pacini-Ketchabaw, cares deeply about the labour poured into generating situated pedagogies and is invested in tracing the consequences of our pedagogical encounters. Inquiry work is made to travel, to proliferate, and to provoke novel and uncertain avenues for thinking pedagogically. The educators that I collaborate with are generous in sharing their brilliance with other educators and students, and they take a keen interest in tracing the spirals of their hard work. I wanted to create articles that might head in dissimilar directions and to unfamiliar audiences, and that could take on a format that is differently readable and actionable than a full-length manuscript might be. As is the nature of writing distinct articles, there is some repetition when these four articles come together, specifically related to the theoretical framework, pedagogical inquiry practices, and participants.

After briefly outlining the content of each article, the remainder of this introduction details the research site where the work that informed the articles took place and elaborates on the practices of pedagogical inquiry work employed in the project.

Article 1. Thinking Physiologies, Bodies, and Flesh Methodologically with Post-Qualitative and Posthuman Education Research

I begin my dissertation by locating my research within ongoing conversations in post-qualitative education research. In the preface that precedes this article, I further elaborate on how I understand the situated and specific ‘politics’ that I submit my work to. Articulating a methodological argument, I trace some of the complexities of thinking physiologies with post-qualitative education research intent on disrupting Euro-Western humanist research habits. I pick up four central provocations that post-qualitative and post-human education research put forward, and debate how different feminist science studies theorizations of ‘physiology’ might entangle with post-qualitative propositions to generate methodological questions ripe for consideration amid the increasingly regulated bodied spaces of education research.

While never resolving the methodological troubles with confronting physiologies with post-qualitative education research, this article begins to articulate the methodological contribution that I hope my research can make to early childhood education and childhood studies. I use one piece of documentation from pedagogical inquiry work to build a case that bodied materialities matter *and* physiological knowledges matter, and that confronting Scientific knowledges with inventive methodological practices might mark a productive entry point for unsettling humanist imperatives in education research. This article surveys the education/inquiry terrain that informs the following three articles.

Article 2. EPOCing with Physical Activity Pedagogical Resources – or, how might Pedagogies hold Physiological Knowledges to Account?

This article is the heartbeat of my dissertation. It details the precise entanglements of post-developmental pedagogies and physiological knowledges that I assert *must* matter to my

engagements with early childhood education. This article begins with an analysis of one mainstream physical activity pedagogical resources in Canada, outlining how this resource combines physiological knowledges with pedagogies in specific, limited, and strategic knots. I use this article to develop a process/practice of crafting pedagogical problems and building pedagogical propositions with physiological knowledges. This practice threads through my final two articles and is a project that I hope to keep extending beyond my dissertation.

In the second half of this article, I think with one of my favourite physiological knowledges from my undergraduate degree: excess post-exercise oxygen consumption. Writing this paper, I dug out my notes from the exercise physiology and body composition courses where I first met this concept. I am often appalled at the questions that my Science-loyal heart did not know how to ask when I was most present in Kinesiology, a discipline where unfamiliar confrontations with inherited knowledges might be incredibly generative. By interrogating excess post-exercise oxygen consumption and physical activity guidelines, I hope that this article might begin to create tiny cracks in existing relationships between Physiological Sciences, Kinesiology/physical education, and early childhood education pedagogies.

Article 3. Muscling Pedagogies (with Diaphragms, Cold Season, Physiological Knowledges, and Fans)

This article, and the fourth article, most specifically engage with documentation and moments from pedagogical inquiry work with children and early childhood educators. To begin, I trace how muscles and pedagogies typically intertwine in Euro-Western early childhood education. I argue that ‘doing’ muscle(s), as opposed to considering muscle to be an intact or stable component of a body, might shift possibilities for thinking muscle(s) pedagogically. Weaving post-developmental pedagogies theorizing with documentation from pedagogical

inquiry work, I articulate a pedagogy of *doing* muscle(s) as *muscling*; muscling as a verb. I use the practice of creating problems with pedagogies and physiological knowledges while generating pedagogical propositions to take physiological knowledges to account that I outlined in Article 2.

As I began to think muscle(s) as muscling, I noticed muscling in a multitude of moments in inquiry work. I found that I could latch on to activeness, entanglement, and the intense intentionality demanded of bodied motion in almost all the moments with/in moving that we documented. Writing this paper at the same time as our movement studio-exhibit was curated and presented, I realized that central to muscling was attending to situatedness. Muscling is about local, contingent, lived muscles. Throughout the article, I foreground diaphragm muscles and cold and flu season to emphasize one situated muscling.

Article 4. Valuating, Fitting, Tending, and Counting with Post-Developmental Fat(s) in Early Childhood Education

I conclude my dissertation with the article that most closely parallels my initial dissertation intentions. In this fourth article, I develop the concept of ‘post-developmental fat(s)’. Integrating moments from pedagogical inquiry, I use the practice that I outlined in Article 2 and took up in Article 3 to build pedagogical problems with fat(s) and generate pedagogical provocations with fat(s). Developing ‘post-developmental fat(s)’, I debate how we might unsettle dominant logics of fat and obesity and think fat(s) as situated, complex, and speculative pedagogical concerns.

The most difficult to write of all four articles, I was surprised by how challenging it was to even speak the word ‘fat’ in a meaningful way during inquiry work and in wider early childhood education spaces. As I discuss in the preface to this article, I profoundly

underestimated how cemented ‘fat’ is within the obesity apparatus in neoliberal education spaces. I assumed that since critical, post-developmental early childhood education is talented at attending to materiality and more-than-human others, thinking with fat(s) would nicely slip into these ongoing practices. Working to distill when our inquiry work conversed with fat(s) in generative ways, I realized how incredibly incorrect this assumption had been. Fat(s) are hard. The moments detailed in this article make clear how I often found myself returning to my body to think with fat(s) because I did not have the methods of attending, or conceptual resources, or bodied courage (or something else) to think fat(s) otherwise. Due to how difficult I found elaborating post-developmental fat(s) to be, this is the article that I am most excited to share with the educators who supported my project.

Pedagogical Inquiry Work

Since 2011, educators and children from a university-based child care program have been collaborating with a team of pedagogical facilitators and researchers to think carefully about how we might develop pedagogical practices relevant to the ethical and political concerns of the mid-sized western Canadian city we are located in. In this project, inaugurated by Dr. Veronica Pacini-Ketchabaw and led by Dr. B. Denise Hodgins, early childhood educators act as co-researchers with pedagogical facilitators in up to five early childhood education classrooms that comprise one child care service. This research has been approved by the Human Research Ethics Board at the University of Victoria. Drawing upon the *British Columbia Early Learning*

Framework (Government of British Columbia, 2008) and the practice of pedagogical narrations⁴, this research aims to contribute to knowledge building in the field of early childhood education pedagogy, while developing critically-informed and creative early childhood education practices that are meaningful to the children and families who attend the child care program.

This ongoing research project is situated within a broader, international project of rethinking early childhood education as a politicized, critical, and innovative field, capable of adequately responding to the local and dispersed tensions, inequities, and realities of increasingly complex and contested childhoods (for example: Canella, 1997; Dahlberg, Moss, & Pence, 2013; Kessler & Swadener, 1992; MacNaughton, 2000). The educators at the child care centre work to bring a critically conscious edge to their practice as they confront legacies of, and ongoing, colonization and the infiltration of neoliberal paradigms in early years practice, while interrogating the possibilities these conditions pose for children's learning. While each pedagogical facilitator/researcher and educator might differently locate themselves amid this larger project of re-envisioning education, I align myself with feminist science studies (Haraway, 2016; Roy, 2007; Stengers, 2010; Willey, 2016) and post-developmental pedagogies theorizing

⁴ In our pedagogical inquiry work, we use the language of 'pedagogical documentation' to extend upon the practice of 'pedagogical narration' outlined by the *British Columbia Early Learning Framework* (Government of British Columbia, 2008). While we integrate the collaborative processes of making our pedagogical thinking public entailed in the *Early Learning Framework*, our intentions in thinking with 'documentation' are multiple: we work to unsettle human exceptionalism by attending to non-human others and material agencies, which troubles anthropocentric practices of narrating (Blaise, Hamm, & Iorio, 2016; Pacini-Ketchabaw, Kind, & Kocher, 2016; Pacini-Ketchabaw, Taylor, & Blaise, 2016); we engage not-easily-'narrated' intensities and materialities, like soil, fatigue, and air flows, as pedagogical concerns; and our practices of 'documenting' are constantly reconfigured with Twitter conversations, layering material artefacts, creating soundscapes, and experimenting with digital photo editing technologies. I provide more description of our practices of pedagogical documentation below.

(for example: Holmes, 2016; Holmes & Jones, 2016; Lather, 2016; Lenz Taguchi, 2016; Rautio & Jokinen, 2015).

I joined this research in 2014. As a pedagogical facilitator/co-researcher, my role, and the role of other colleagues who are part of the School of Child and Youth Care at the University of Victoria, is multilayered. As pedagogical facilitators, we support educators in deepening the intentional, politicized, and/or critical character of our pedagogical reflections. Pedagogical facilitators participate directly in activities with children and educators, step back and collect documentation, and/or provide support that allows for educators to be more immersed in inquiry work. In other moments, our role is to support educators in thinking with the documentation we produce together, as we provide alternate readings of narrations written by educators or ask critical questions of what different moments in practice, or pieces of documentation, might produce/do/mean for children's learning. We frequently seek out articles and artists for inspiration or to assist as we deepen our engagement with the concepts and practices that emerge through our work. We also organize workshops with educators, where we share documentation and engage in sustained, specific dialogue about our projects.

This pedagogical facilitation support is intertwined with our role as researchers. As researchers, we craft pedagogical documentation and write analyses based on inquiry work that can travel beyond the centers. While all children and educators can participate in inquiry work and pedagogical facilitation, we are very careful to only share documentation from children and educators who have explicitly consented to participate in the research. As Nxumalo (2014) has outlined, negotiating a dual facilitator-research role entails an accountability to all participants in inquiry work for how our experimentations are interpreted and shared in my writing. While guardians complete consent forms on behalf of children, we check in with children about taking

photographs and often share our cameras or review collected photographs with interested children. Please see the Parents' Information Letter (Appendix A), the Parents' Information Letter and Informed Consent Form (Appendix B), and Participant Educator Information Letter and Informed Consent Form (Appendix C) for a detailed explanation of the differences between inquiry work and research, and a discussion of our protocol for disseminating documentation data.

Over the past seven years, this group of educators, children, and researchers have crafted a (continually revised) process for conducting 'inquiry work' that is fluid and emergent, but always oriented toward politicized considerations of practice and pedagogy. Inquiry work has become quite familiar in many of the classrooms at the child care centre, such that this process is an important component of everyday practice and the research team are well-known to children and families. In previous inquiries, educators, children, and researchers have focused on materials in art encounters, including clay (Clark & Elliott, 2014; Yazbeck, 2013), paint (Clark & Nelson, 2014; Clark, Pacini-Ketchabaw, & Hodgins, 2014), tape, and textiles (Hodgins, 2015); multispecies relations (Nelson, in press; Taylor & Pacini-Ketchabaw, 2015; Yazbeck, Norman, Danis, & Pickup, 2016a) and settler colonial forest entanglements (Pacini-Ketchabaw, 2013; Yazbeck & Danis, 2015; Yazbeck, Norman, Danis, & Pickup, 2016b).

We use the language of 'inquiries', 'provocations', and 'documentation' to describe different components of our work. We activate our work by conceptualizing some 'inquiries' that might be generative. Suggestions for inquiries emerge from questions, tensions, or areas of interest identified by educators, children, and pedagogical facilitators. For example, the movement inquiry that took place during Spring 2016 (which is detailed in the next section) emerged through educators' differing interests in mindfulness and gross motor movement,

combined with the children and educators' shared connections to doing yoga and creating obstacle courses together, coupled with my hope to think critically about movement. We then generate provocations that might help us to engage differently with the focus (the materials, the concepts, the 'problems') of our inquiry work. Children, educators, and researchers work with these provocations together, following differential threads that emerge through our engagements. We think about intentionality and pedagogy, and trace different understandings, concepts, and frictions. We document these inquiries in multiple forms, including photographs (taken by children, educators, and researchers on DSLR cameras and automatic cameras clipped to clothes), video, written reflections, notes tacked to walls, children's questions and ideas, Twitter exchanges with international colleagues, and lengthy digital conversations. We treat this documentation as a site for collective critical reflection on practice (Lenz-Taguchi, 2010; Pacini-Ketchabaw, Kind, & Kocher, 2016; Pacini-Ketchabaw, Nxumalo, Kocher, Elliott, & Sanchez, 2015; Rinaldi, 2001). With documentation, we propose further provocations and continue to chase down different possibilities for thinking about pedagogy in relation to the focus of the inquiry.

Pedagogical Inquiry and Movement

The articles in this dissertation draw from two separate bouts of pedagogical inquiry focused on movement. The first inquiry took place from May to June 2016 and the second unfolded during January and February 2017. While not explicitly discussed in this dissertation, we have been working with movement through multiple past inquiries. Different groups of educators, children, and researchers have traced how moving happens with clay (Yazbeck, 2013), experimented with site specific movement and dance, moved with tape through indoor and outdoor spaces, and followed human and non-human motion within forest encounters.

In May 2016, Dr. Pacini-Ketchabaw, Narda Nelson, and I proposed to a classroom with 16 toddler-aged children and 4 educators that we were interested in thinking about movement. We (educators and researchers) started to develop questions around how movement might be entangled with the spaces of early childhood education. As a provocation, we moved the furniture out of the classroom before the children arrived one morning. We set the intention to think about how we can purposefully work with movement with/in the space and attended to how different movements were enabled and constrained with different educator and researcher-bodied configurations. Over the next six weeks, we continued to imagine what movement could do in the space and brought different provocations, including sound, music, light, shadow, and hanging paper. We asked questions about the possibilities for moving bodies, while also attending to the other worldly movements we encountered. We thought about scales of movement, the relations movement creates and disrupts, and how movement happens.

In preparation for the studio-exhibit we shared at our university in March 2017, Dr. B. Denise Hodgins, Narda Nelson, and I proposed a second movement inquiry to three classrooms. We suggested that we think with movement in the common atrium space shared by all three classrooms. One classroom was the same toddler-aged program from the spring inquiry, with 16 children (approximately half of the children had participated in the previous work) and 4 educators. Two preschool-aged classrooms also participated, and each had approximately 24 children and 4 educators in their program. As the atrium is located between all the classrooms, we often had the doors open during inquiry work and children and educators could flow into the space as they wished. The inquiry proceeded over five weeks. In Table 1 below, I detail the central questions pedagogical facilitators shared with educators, the provocations we offered

children and educators, and some of the moments and responses that emerged as we collectively engaged the questions and provocations.

Table 1
Questions, Provocations, and Responses through 2017 Movement Inquiry

	<u>Question</u>	<u>Provocation</u>	<u>Moments and responses</u>
Week One	How do we notice, trace, or engage with movement differently at different times?	Taped white paper along the walls and floor of the empty atrium	Children brought in markers, scissors, and stamps, followed the lines of the paper, travelled across the 'pathways' the paper generated, and intentionally and incidentally tore the paper into fragments
Week Two	How do we respond to/with movement differently at different times?	Rolled the pieces of paper that remained from the previous week into tiny spirals and cones	Children and educators tossed paper cones, made new rolls, and began experimenting with breathing as a method for moving the bundles of paper
Week Three	How do different movements invite (other) different movements?	Brought in electric fans to extend our curiosity about moving with air and breath	Children screamed into fans, pushed sheets of paper into fast-whirring fan blades, and negotiated the politics of limited fan access and (adult) discomforts related to safety
Week Four	How can we experiment with the possibilities for moving in the atrium?	Piled mats that the children use for nap time in the center of the space to challenge the small movements the fans had invited the previous week	Jumping, smashing, leaping, balancing, bouncing, rest, and slowness emerged as children negotiated the different possibilities for moving that the mat(s) enacted
Week Five	How can we engage the political complexities of moving in the atrium?	Laid nap time mats on their sides against walls and tables, (rather than flat across the ground)	Children crafted spaces and forts, bodies launched off tables into crash pads, and we noticed collaborations and conversations with/in movements with mats

Throughout both inquiries, we thought with many images and short narrations penned by educators and pedagogical facilitators. In the second inquiry, we shared documentation from each week on a wall in the atrium, and educators and families responded to weekly questions by jotting reflections on Post-It notes that were then moved around the wall as our documentation expanded and evolved. These images and notes were then re-purposed into a different hanging

provocation in the center of the atrium by the educators during a professional development workshop. While I have not included any images or direct excerpts from this documentation in the four articles that follow, I did return often to our documentation during my writing process. I have numerous photographs with scribbled notes and carefully attending to these images has helped me to tune deeply to the minute complexities of fat(s), muscle(s), and moving in our inquiry. Many of the moments from our inquiry appear in more than one article or nourish central ideas (like muscling) but are not specifically mentioned in any article. Our documentation has mattered a great deal to my thinking, and as such, I conclude this introduction by presenting four images that I have created over the course of writing. These images do not precisely connect to any one piece of analysis, but they move through all four articles and make visible how our practices of documentation and pedagogical inquiry animate my dissertation.

Week One: How do we notice, trace, or engage with movement differently, at different times?

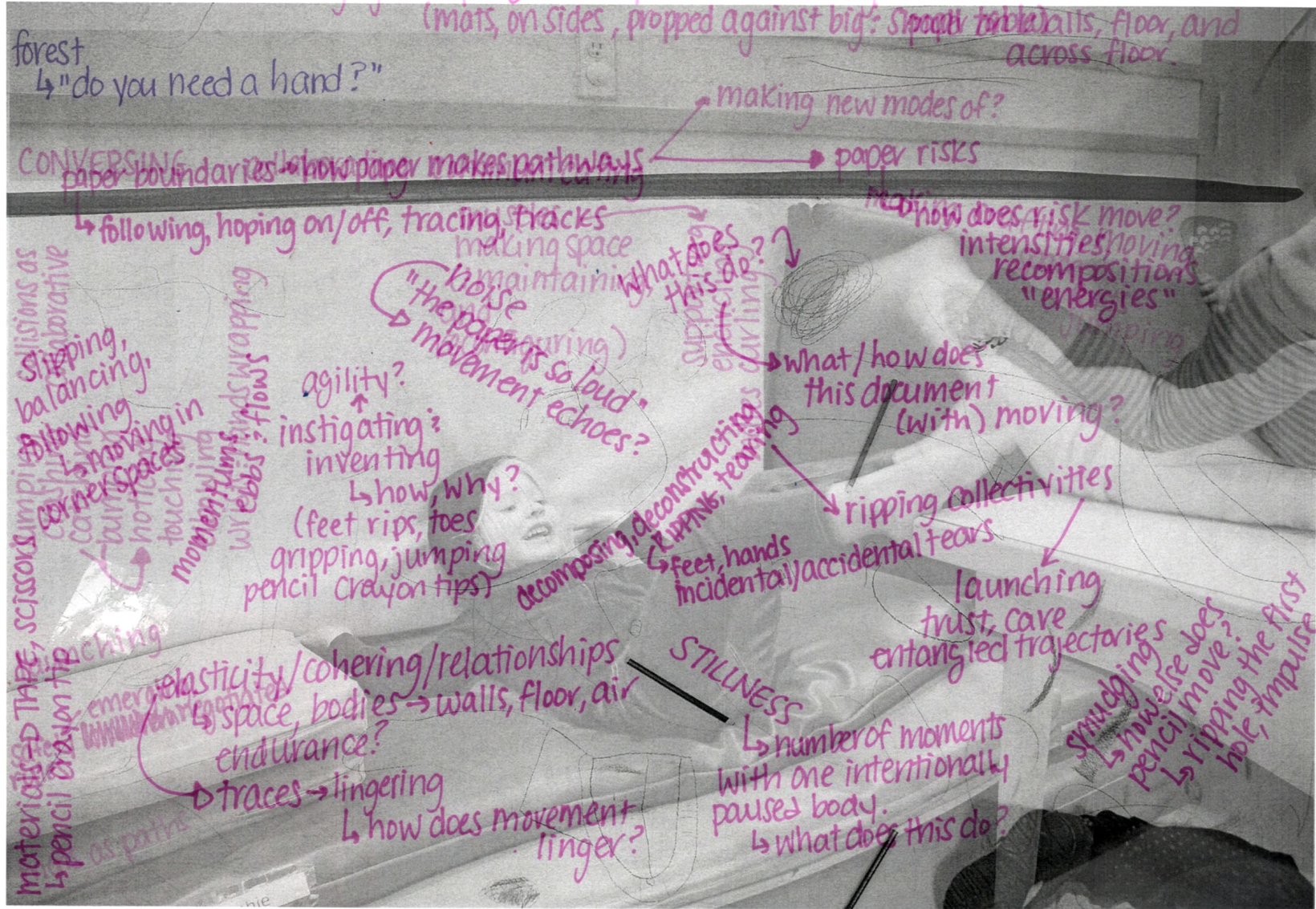


Figure 1. Layering notes/scribbles from the first week of our January movement inquiry work with week five notes.



Figure 2. Body-bridging with Google Scholar search results for childhood + muscles.



Figure 3. Noticing stillness and breath with tracing, layering, and dissecting documentation.

GUIDELINES

For optimal health benefits, children and youth (aged 5–17 years) should achieve high levels of physical activity, low levels of sedentary behaviour, and sufficient sleep each day.

A healthy 24 hours includes:

SWEAT

MODERATE TO VIGOROUS PHYSICAL ACTIVITY
An accumulation of at least 60 minutes per day of moderate to vigorous physical activity involving a variety of aerobic activities, and muscle and bone strengthening activities should each be incorporated at least 3 days per week;

STEP

LIGHT PHYSICAL ACTIVITY
Several hours of a variety of structured and unstructured light physical activities;

SLEEP

SLEEP
Uninterrupted 9 to 11 hours of sleep per night for those aged 5–13 years and 8 to 10 hours per night for those aged 14–17 years, with consistent bed and wake-up times;

SIT

SEDENTARY BEHAVIOUR
No more than 2 hours per day of recreational screen time; Limited sitting for extended periods.



Figure 4. Complexifying the Canadian 24 Hour Movement Guidelines for Children and Youth (Canadian Society for Exercise Physiology, 2016) with documentation images, my inquiry notes, and my study guide from an exercise physiology course.

Having traced how my dissertation project has evolved to think fat(s), muscle(s), movement, and physiologies with post-developmental early childhood education pedagogies, I have begun to carve out the tentative and continually splintering – but precise and consequential – political and ethical contours of my research. Throughout the following four articles, I tend carefully to these intentions as I work toward becoming answerable to the situated accountabilities that my engagements with muscle(s), fat(s), movement, physiological knowledges, and pedagogies entail. I have also detailed the features of our pedagogical inquiry work that nourish this research, marking another tendon of specific ethical, political, material, and methodological entanglement(s) that weaves through the four articles. I now move into presenting the articles that comprise my project.

Preface to Article 1

Throughout my dissertation, I bring Physiology into conversation with feminist science studies, post-developmental pedagogies, and post-qualitative research. In all four articles, I return to Willey's (2016) contention that "when we claim sciences, instead of 'engaging' them, the terrain shifts from one of how un/friendly feminists are to Science to one of what a world of sciences has to offer, where so much is at stake" (p. 146). I read Willey's proposal methodologically in this article, and make a case for how, and why, I might 'claim' sciences with/in post-qualitative education research. I argue that thinking physiologies with post-qualitative research with feminist science studies is an intentionally tense undertaking for two reasons: (1) because Physiology is complicit in dominant Euro-Western ontologies predicated on rationality, certainty, and the enduring legitimacy of human inquiry, while post-qualitative education research troubles these humanist habits; and (2) because I assert that settlers who have the privilege of accessing Scientific knowledge systems can craft methodologies made of different Euro-Western frameworks, and these methodologies can complexify the epistemological hegemony that Physiology holds in education research and practice in Canada.

I direct this article toward a post-qualitative education research audience and hope that it might be relevant to a methodologies journal. After locating my work within four ongoing debates/tensions/propositions that post-qualitative and posthuman education research put forward, I discuss how integrating various feminist science studies understandings of Physiology might contribute to, or complexify, how education research currently thinks with physiological knowledges, bodies, and flesh. As I layer different post-qualitative concerns with various physiologies, I re-visit one piece of documentation from pedagogical inquiry work. This grounds the article in an exploration of how I might act on the analysis I am providing, while making

clear that the threads of feminist science studies and post-qualitative theorizing that I knit together with documentation are partial and imperfect. I think with this documentation methodologically – pedagogical curiosities might emerge within this article, but I do not take them up. This article contributes to ongoing discussions in post-qualitative education research, surveys the methodological roots of the physiology-entangled pedagogies I think with in Articles 2, 3, and 4, and provides an illustration of how I might momentarily confront, claim, and deploy physiologies with education research in one local, partial methodological undertaking.

I want to make clear that I do not seek ‘solutions’ to ongoing debates or present universalizable methodological practices. Building on my discussion of politics and ethics in my introduction, I understand that the post-qualitative and posthuman theories I utilize are power-laden and exclusionary frameworks (Roy & Subramaniam, 2016). I, as a settler, do not get to argue that post-qualitative methodologies automatically generate just, disruptive, or productive knowledges. I need to continually intervene in the spaces where my body, and the matters and knowledges that compose it, are profoundly privileged. I want to do physiologies methodologically with post-qualitative and posthuman research practices, while being accountable to the matters and knowledges and bodies and lives that Physiology remains impenetrable or imperceptible to. If this reads like I am writing myself into a circular conundrum, I am – intentionally: I begin from, complexify, re-center, think with, critique, live within, hope to unsettle, and fail to unsettle various Euro-Western knowledges (Physiology, Humanisms, feminist science studies, post-qualitative methodologies). Thinking physiologies methodologically, for me, is a very bounded, specific, and imperfect project. The word ‘partial’ does a lot of work in this article to make clear that I want to stick with my situated limitations and precise theoretical resources, rather than working to generalize or over-extend my analysis.

Article 1.**Thinking Physiologies, Bodies, and Flesh Methodologically
with Post-Qualitative and Posthuman Education Research****Abstract**

This article debates methodological possibilities for thinking Physiology, informed by feminist science studies conceptualizations of scientific knowledge, with post-qualitative education research practices. Offering an emergent articulation of how physiologies might become differently and productively entangled with feminist science studies, post-qualitative research, and posthuman enactments of fleshy bodies, I propose that education research can engage (with) physiologies with generative, non-essentialist, accountable methodological practices. I think four post-qualitative methodological concerns alongside insights from feminist science studies, weaving my exploration with a moment from an early childhood education pedagogical inquiry research project. Attending to the tensions, practices, and possibilities that emerge when post-qualitative research and physiologies converse, I argue, might generate novel methodological practices that contribute to post-qualitative projects intent on refusing humanist habits in education research.

Keywords: post-qualitative research, feminist science studies, posthuman methodologies, bodies, physiology

This article outlines methodological possibilities for integrating feminist science studies-informed understandings of Physiological Science with post-qualitative education research methodologies. Extending feminist science studies scholar Willey's (2016) assertion that "when we claim sciences, instead of 'engaging' them, the terrain shifts from one of how un/friendly feminists are to Science to one of what a world of sciences has to offer, where so much is at stake" (p. 146), I propose that *education research can engage (with) physiologies with generative, non-essentialist, accountable methodological practices*. I read four central post-qualitative methodological concerns alongside feminist science studies interventions into the hegemonic status ascribed to mainstream Sciences, tracing how feminist science studies insights might contribute to ongoing post-qualitative debates and inquiries in education research. Importantly, I argue that education research practices oriented toward dismantling colonial knowledge structures loyal to logics of humanism and transcendent truth can – and, as one specific interjection, *must* – think with physiological knowledges that matter in contemporary education. Grounded in one moment from an early childhood education pedagogical inquiry, I offer an emergent articulation of how physiologies might become differently, and productively, entangled with messy, uneven, and fragmented knots of post-qualitative research, feminist science studies, and posthuman enactments of fleshy bodies.

Post-qualitative research in education generates methodological practices that attempt to intervene in Euro-Western humanist modes of inquiry (Lather & St. Pierre, 2013; MacLure, 2011; St, Pierre, 2014a). As St. Pierre (2014a) elaborates, post-qualitative methodologies persistently "engage the ontological, which is too often ignored in the epistemological rage for meaning that centers the Cartesian knowledge projects privileged in the academy" (p. 3) as one strategy for dismantling the interpretative, anthropocentric, representational, and positivist

imperatives of hegemonic knowledge structures (Koro-Ljungberg & Mazzei, 2012; St. Pierre, 2012, 2015a). For post-qualitative education scholars, it is with/in a “commitment to consider different orders of things, different distributions, that have been and might be” (St. Pierre, 2014a, p. 14) that post-qualitative research becomes a question of intentionally immersing research in contested, disruptive ontological debate and experimentation (Lather & St. Pierre, 2013). Dipping into the swells of ‘post’ (human, structural, modern) ontologies, post-qualitative research often leans into feminist new materialisms (Dolphijn & van der Tuin, 2012; St. Pierre, 2015b; St. Pierre, Jackson, & Mazzei, 2016). These methodologies trace how agential realist empiricism(s) might cut with/in dominant epistemological and ontological categories, re-animating what might be required to *do* data (Koro-Ljungberg & MacLure, 2013; St. Pierre & Jackson, 2014), writing (Lenz Taguchi, 2013; Mazzei, 2013a; St. Pierre, 2014b) and concepts (Lenz Taguchi, 2016) when individualized subjectivity, researcher objectivity, and enduring interpretative certainty are made unintelligible.

Proposing that education research can engage (with) physiologies with generative, non-essentialist, answerable methodological practices, I structure this exploration of how physiologies and post-qualitative research methodologies might become productively entangled around four threads of concern in contemporary Euro-Western post-qualitative education research. The first thread that I attend to takes seriously (1) an ethico-onto-epistemological (Barad, 2007) impulse toward infiltrating and disrupting canonical methodological practices loyal to humanist logics (Koro-Ljungberg & Mazzei, 2012; Lather, 2013; MacLure, 2013a; St. Pierre, 2013a, 2013b), including the traces of Euro-Western hegemonic knowledges that interject in experimental research processes (Lenz Taguchi, 2013; MacLure, 2011). The second thread of concern confronts (2) the methodological and ethical consequences of persistently engaging with

positivist Euro-Western Scientific knowledges while working to unsettle knowledge hierarchies in settler colonial spaces (in this citation, I emphasize that scholars who elaborate this concern from non-Euro-Western or racialized or minoritized epistemic positions [Prescod-Weinstein, 2017; Roy & Subramaniam, 2016; TallBear, 2013; Todd, 2015] tackle different concerns than scholars who primarily employ Euro-Western theories, including post-qualitative research or feminist new materialisms [Lather, 2012; Sanabria, 2016; Willey, 2016; Yoshizawa, 2012]. This article contributes to the latter project). The third thread orients toward (3) cultivating methodologies that risk the ontological vulnerability entailed in inquiring with feminist new materialisms and post-human theorizing (Dolphijn & van der Tuin, 2012; Lather, 2016; MacLure, 2013b; Mazzei, 2013a; Taylor, 2016). The final thread that I pick up wonders how methodologies might encounter flesh with non-anthropocentric bodied knowledges (Banerjee & Blaise, 2013; Pacini-Ketchabaw, Taylor, & Blaise, 2016; Rautio, 2013), where anxieties about erasing fleshed lives (Ahmed, 2008) become knotted with charges of anti-biologism (Wilson, 2015) until neither or ‘embodiment’ or ‘empiricism’ or ‘physiology’ feel quite adequate.

Occupying the exact Humanist ontological terrain that post-qualitative research responds to, Physiology, a branch of mainstream Euro-Western science rooted at the juncture of biochemistry, biology, and anatomy, studies how living organisms function. Physiology (with the capital ‘P’) designates one powerful epistemic tradition of flesh as it inquires into how constituent parts of bodies enable ‘normal’ life for an organism. This includes a focus on the functionality of biological systems centered in cellular interactions, biochemical signals, and anatomical cooperativity. Physiology comes to matter behind many neoliberal imperatives in education because the ‘answers’ Physiology gives to questions of ‘how’ bodies happen become deeply consequential. For example, Physiological mechanisms of metabolism underpin

recommendations for nutrition provision, understandings of muscle Physiology dictate how bodies should move in physical activity recommendations, and conceptions of hormones, brain matter, and neurotransmitters come to explain and predict what bodies can, and should, do.

Positioning Physiology as a colonial Science attuned to bodied function and process, I begin by discussing why post-qualitative research might, and should, mark an important methodological terrain for generating conversations, collaborations, and tensions between Physiology and research traditions that aim to disrupt humanist modes of inquiry. I think with ‘physio/logy’, which I build from concepts developed by Roy and Subramaniam (2016) and Willey (2016), to describe how post-qualitative research might enter into novel alliances with feminist science studies-informed enactments of Physiology. I then take up the four threads of concern in post-qualitative research that I outlined above. For each concern, I trace how this impulse is engaged in post-qualitative literature, layer in a feminist science studies concept that extends or complexifies this intention, and weave together post-qualitative research, feminist science studies, and physiologies in a ‘doing’ with documentation from an ongoing research project. Throughout the article, I hold an attunement to process at the forefront, as I articulate *how* physiologies might matter, methodologically, with post-qualitative education research practices.

Thinking Physio/logies Methodologically with Post-Qualitative Education Research

Why think (differently) with Physiology in post-qualitative education research? My work argues for a re-articulation of how fat(s), muscle(s), and movement can matter in early childhood education pedagogies (Articles 2, 3, and 4, in this dissertation). In a Euro-Western state where Physiological conceptions of flesh invest in creating and maintaining bodies governed by physical activity regulations, dictates of normative health and development, and biochemically-

mediated fear of obesity, I assert that differently claiming (Willey, 2016), infiltrating, and deploying physiological knowledges is an increasingly urgent project. Physiology matters because it forms the evidence-based backbone of governmental machinations that mark different lives and bodies as differently healthy/unhealthy, normal/abnormal, human/inhuman, and legitimate/illegitimate in line with the settler colonial epistemologies upon which positivist Sciences stand. I argue that because the politics of Physiology are relevant, and because Physiology has consequences, Physiology is worthy of critically creative disruption.

Lather (2016) proposes that post-qualitative research should “move from what needs to be opposed to what can be imagined out of what is already happening” (p. 129). Extending Lather’s proposition to Physiology, I argue that intentionally sticking with Physiology might mark one narrow vein for disrupting Euro-Western, human-centered, positivist research traditions. What if, instead of ignoring, critiquing, obscuring, or beginning from a terrain outside of Scientific hegemonies, one little facet of education research chisels at Scientific structures differently? How might education research methodologies engender, as Willey (2016) proposes, a partial “vision of what it might look like to politicize scientific knowledge production in a way that allows for an answerability, an accountability, beyond the realm of internal critique, that science as we know it lacks” (p. 14)? Rather than only overtly critiquing Science for its deeply troubling governmental loyalties, how might we put Physiology to work in ways that make these oppressive allegiances unintelligible? Throughout this article, I argue that actively dragging inherited epistemologies into conversation with methodological interventions into colonial knowledge structures might begin to unsettle the humanist underpinnings that allow for Physiology to become a positivist structure.

Physio/logy and Methodology

Integrating Physiology with post-qualitative research is an onto-epistemological (Barad, 2007) proposition, one that questions what Physiology must ask of post-qualitative research and what post-qualitative research might demand of Physiology to engage in productive collaboration. This is not a practice of bringing Physiology to an intact post-qualitative frame, nor of introducing a stable post-qualitative tradition to a bounded Physiological Sciences discipline. While adding knowledges from Physiology to post-qualitative methodologies might be interesting, simply plopping a Science into a divergent methodological practice does not unsettle the humanist, Euro-Western conventions of that Science, nor does it tip post-qualitative research toward confronting or extending its own borders. Rather, to engage Physiology generatively, post-qualitative research must engage a precise physiology; physiologies that muddle and extend, but can converse with, post-qualitative onto-epistemological footings. I think with ‘physio/logy’, motivated by Willey (2016) and Roy and Subramaniam (2016).

Willey (2016) argues for an attention to how biologies are made methodologically with/in different theoretical orientations. Tracing the nuanced debates (Davis, 2009; van der Tuin, 2008) launched by Sara Ahmed’s (2008) reading of Elizabeth Wilson’s (2004) assertion of feminism’s anti-biological tendencies, Willey elaborates a common methodological bent toward conflating biology as a specific scientific practice and biology as lived flesh. Citing Wilson’s assertion of feminism’s anti-biological habits, Ahmed’s centering of feminist labours and histories that engage the biological, and Davis’ discussion of the need for feminism to engage a different kind of biology made of material-discursive entanglements, Willey makes clear how these arguments do not carefully detach disciplinary bodied knowledge from fleshed bodied knowledge. Rather, they hold the ‘biological’ intact at different junctures of flesh and Science. This ‘slippage’

between the epistemic conventions of scientific inquiry and the lived flesh of the body is, Willey argues, “important because it makes it appear as though the science of ‘biology’ were an unmediated representation of the ‘the body itself’” (p. 18). Importantly, Willey contends that if we hope to confront the epistemic hegemony of bioscientific knowledges, we must parse Biological Scientific traditions from bodied details because the ease with which flesh and Euro-Western Bioscientific traditions are conflated is a function of dominant colonial epistemic structures. Disentangling this methodological habit, Willey claims, makes visible the borders of Euro-Western Scientific inquiry as they collide with lively flesh and multidisciplinary, multi-epistemic practices of generating knowledges with/in bodies.

As a methodological problem, I hear Willey (2016) propose that this habitual slippage between flesh and epistemological convention marks an important knot for thinking biologies methodologically *with* feminist science studies (and, I would add, with education research). Confronting this conflation must “necessitate a certain kind of resistance to disciplinary divides” (Willey, 2016, p. 19) – divides in which both feminist science studies and post-qualitative research can be complicit. With Willey, methodologies should refuse epistemic boundaries that allow for the ‘study’ of the body to be parsed, even partially, from lively fleshy bodies, *while* recognizing that Scientific knowledge about the body does not come to matter in the same way that differently crafted fleshy knowledges do. Roy and Subramaniam (2016) expand this discussion by detailing bio/logy as the bios (in this case, flesh) and logy (knowledge(s)), while arguing that “to be critical of these processes [of studying flesh or fleshed knowledges] does not mean that one rejects matter, bios, the body or repudiates a field entirely” (p. 33). Rather, Roy and Subramaniam are concerned that over investing in overt critique of the structuring forces that allow for flesh to become parsed from knowledge has “taken a great deal of energy and time

away from the work of reimagining *how* we as feminists can think about biology differently, and *what* that biology can teach us” (p. 33).

Thinking with Willey (2016) and Roy and Subramaniam (2016), intervening in the dominance of Physiological Sciences as a project of infiltrating colonial knowledge structures means attuning to how feminist engagements with Scientific data (Physiology) matter, while attending to salient critiques about the politics of Scientific knowledge production. I read this insight alongside Lather’s (2016) post-qualitative contention that “motored by practice, the new emerges out of infiltrating/embedding/infusing, not killing” (p. 127) to understand that, rather than putting resources into only critiquing Science, we might use bio/logy to foreground the fleshy epistemic tensions that tending to both edges of this term might entail. The layered obligations of bio/logy, which I think as physio/logy, invoke a doubled methodological impulse. With physio/logy, we might work to re-create what it means to do physio(and)logy, with post-qualitative education research methodologies that refuse to separate ontology from epistemology from ethics from liveliness, *while* refusing to retreat from being accountable to existing systems of positivist ‘true’ Sciences about bodies.

As I read Willey (2016) and Roy and Subramaniam (2016) write with bio/logy, I hear an appeal toward a specific methodological framework – physio/logy is not an assertion that knowledge is distinct from flesh, nor that flesh can be parsed from epistemology. Physio/logy is a reminder that Physiology can never be only physio, ology, or a perfectly bounded Physiology. I use physio/logy to brace my understanding of how Physiology and post-qualitative methodologies become entangled throughout this article. I am interested in post-qualitative methodologies made with the inextricability of physio and ology; methodologies that are fleshy knowledge-generating practices, and that know that how flesh and knowledge come to matter is

precise. The physio/logies – and post-qualitative methodologies – that I think with compose and are composed by situated knots of knowledge generation, flesh, and inherited knowledges, and work to (re)organize how knowledges and flesh become tangled, unsettled, and re-tangled.

Pedagogical Inquiry

To anchor this article, I think with documentation from one moment in an ongoing pedagogical inquiry project with preschool-aged children and educators in a child care center located in British Columbia, Canada. As part of an ongoing multi-year collaborative research program, educators, children, families, and researchers investigate how we¹ might craft pedagogies relevant to the tensions, challenges, privileges and politics of living in contemporary Canada. Methodologically, our ‘inquiry work’ practices are informed by post-qualitative research as we put humanist ideas of truth, objectivity, positivism, and representational logic at risk (Hodgins, 2014; Nxumalo, 2016; Olsson, 2009). Our overarching methodological framework employs post-qualitative and feminist new materialisms-inspired pedagogical documentation (Hodgins, 2012; Hultman & Lenz Taguchi, 2010; Pacini-Ketchabaw, Nxumalo, & Kocher, Elliot, & Sanchez, 2015). We understand pedagogical documentation as an ongoing practice of attending to the expansive liveliness of everyday encounters, as we document these moments in ways that tend to nuance as closely as possible and return to this documentation to trace its multiple complexities as we layer in additional questions, tensions, or experiences. Documentation is, for us, an activity, not an object. Our documentation often initially takes the

¹ I use the language of ‘*our*’ inquiry to refer to the collective methodological practices that children, families, educators, and researcher practice. While I understand how our methodology matters from my perspective, and each educator and researcher foregrounds different post-qualitative entanglements (materiality, more-than-human encounters, sound, energy) in our work, I use ‘*we*’ to make clear how my experience, and the methodological insights that I work through, are part of a shared inquiry process.

form of photography, written narrations of everyday moments, audio recordings, and artefacts that children and educators have created. Importantly, as we craft and revisit documentation, we work to disrupt narratives of universalized childhoods and normative, child-centered developmental education by attending to more-than-human, material, or affective actants (Blaise, Hamm, & Iorio, 2016; Hodgins, 2015; Lenz Taguchi, 2011; Nxumalo & Pacini-Ketchabaw, 2017). As such, we do not frame our documentation as true, wholly accurate, or final. Our practices of documenting are partial, intentional, and processual. We also understand documentation, analysis, and pedagogy to be iterative. Documentation is generated within everyday moments that make us curious about pedagogy, and we make meaning of how these events matter pedagogically as we allow documentation to percolate through our writing, conversations, and daily encounters (Early Childhood Pedagogies Collaboratory, n.d.).

The specific moment that I think with in this article happened during a pedagogical inquiry where we were curious about children, educators, and researchers might care and move with/in the forest. I quickly jotted this description down with an accompanying note detailing how this moment was both incredibly mundane and loudly screaming for a physio/logy-entangled analysis. The richly common character of this moment, and the written form of documentation it takes, is why I have elected to share it here. Throughout this article, I will re-engage this ‘muddy buddy’ documentation through four methodological ‘doings’ as I elaborate how feminist science studies conceptions of physio/logy can become productively entangled with post-qualitative methodologies:

Eight children, one educator, and two researchers are preparing to head outside to the forest on a chilly, damp morning. As the educator hands each child their ‘muddy buddy’, which is a one-piece waterproof rain suit, the child that I have been chatting with, Carly,

asks me why she needs to wear a muddy buddy. ‘It is rainy outside, and I am worried that your body might get too cold without a muddy buddy’, I answer. Carly pushes her legs into her muddy buddy, which is still wet from yesterday, and asks for my help closing its waist-to-neck zipper. Shivering, I tug at the plastic fabric to try to align the twisted zipper, Carly takes a big breath in and yanks at the zipper pull, and we quickly realize that this muddy buddy is not going to cooperate. We cannot close this zipper.

I need to emphasize that, in line with our pedagogical documentation practices, my engagement with this documentation does not end with the four methodological ‘doings’ in this article.

Rather, I elaborate these four practices because *how* they transform my initial documentation of this moment might have different consequences for *how* this moment can become meaningful pedagogically. While a pedagogical analysis is beyond the scope of this article, I conclude by presenting a re-imagined iteration of this documentation to illustrate how weaving physio/logies and post-qualitative methodologies with this documentation might foreground different pedagogical concerns.

(Post-Qualitative) Physio/logy

Thread One: Infiltrating Humanist Methodological Habits with Physio/logies

Traditional academic inquiry, from canonical Euro-Western Sciences to mainstream qualitative research, owes to positivist conceptions of enduring truth and depends upon assumptions of validity, rationality, reliability, and epistemic accuracy enabled by humanist ontologies amid contemporary neoliberal and colonial structures (Haraway, 1988; Lather, 2013; Prescod-Weinstein, 2017; Roy & Subramaniam, 2016; St. Pierre, 2013a, 2014a; TallBear, 2013; Todd, 2015). Post-qualitative scholars put critiques of positivism to work by generating “knowledge-making practices which are immanent, embodied, embedded, entangled and

situated; which privilege indeterminacy, uncontainability, excess, multiplicity, and the happenstance” (Taylor 2017, p. 322). Concurrent with unsettling humanist imperatives of truth and positivism, foregrounded in many post-qualitative projects are critical interventions into how representational logic makes meaning of ‘things’ through pre-articulated frames of reference (MacLure, 2011). In a post-qualitative methodological space where representationalism becomes imperceptible, research becomes attuned to unknowability and uncertainty, pauses and pushes, and material-discursive incursions that allow for fleeting, imperfect, situated, and consequential meaning making (MacLure, 2013b).

When post-qualitative methodologies intervene in humanist logics of truth, positivism, and representationalism, the ontological structures that allow for a bodied-knowledge power ranking where Physiology is ascribed epistemic authority become unsettled, and “two-way traffic between the sciences and the humanities becomes thinkable” (Lather, 2016, p. 126). This, I argue, crafts physio/logy as a conversant logic, resource, and/or accomplice with critical education research. MacLure (2013b) pushes this transdisciplinary collaborative impulse further, arguing that “Science can no longer be thought, therefore, as the bad other or the big brother of qualitative research...a materialist ontology also challenges the status of qualitative research per se, since boundaries between qualitative and quantitative cannot stand” (p. 659). I hear Lather (2016) and MacLure arguing that as post-qualitative methodologies work to unsettle humanist epistemic habits, the margins of both physio/logy and post-qualitative research become unstable and these knowledge-generating systems *must* converse differently. How then might physio/logy attune to the political consequences of thinking Physiologically in a methodological space where truth, positivism, and representationalism become impossible?

Physio/logical knowledges. I turn to Landecker's (2013) concept of "fat knowledge" (p. 498) to think with physiological knowledge(s). Landecker – a feminist science studies scholar of metabolism(s) – argues that "while many ask the question of what causes metabolic disorder...we should reverse the formulation and ask instead what metabolic disorder is causing; specifically, what are its knowledge effects? Might we speak of a *fat knowledge*?" (p. 498). Fat knowledges probe the consequences of fat(s); they wonder what fat(s) can do and trace how fat(s) matter. Extending fat knowledges with physio/logy, physio/logical knowledges effect the specific knowledge consequences of Physiology: they are the parcels of knowing flesh that are produced with matter and varied traditions of knowledge. Physio/logical knowledges refuse representational logic because, rather than assuming physio/logies can be represented or that physio/logies can endure across temporal or bodied intervals (as Physiology does), physio/logical knowledges are concerned with local, specific, and partial epistemically-lived consequences that emerge in moments where physio/logies happen/matter/unfold.

Physio/logical knowledges, as a feminist science studies concept potentially capable of joining post-qualitative methodologies aimed at unsettling humanist methodological customs, can participate in methodological practices in precise ways. When physio/logical knowledges are multiple, they are nuanced, situated, and active contributors in inquiry practices. St. Pierre (2013b) argues that in traditional humanist inquiry, "verification, truth claims, in logical positivism/empiricism depend on sense, brute data" (p. 223), and that post-qualitative research practices must not only refuse brute data, but literally make the conditions that allow for brute data to happen impossible. Thinking physio/logical knowledges methodologically then, demands never allowing physio/logies to matter as brute data because orienting toward entanglement and consequence and infiltration refuses to give credence to any assertion of representational purity

within Physiology. Doing post-qualitative methodologies with physio/logical knowledges, I might wonder how tuning to the expansive affective agencies of physio/logy might do the “difficult work of taking that given structure [Physiology] very seriously, so seriously that it has dismantled itself” (St. Pierre, 2013b, p. 226). This requires that I generate a methodological playing field where inherited descriptions of Physiology become data so slippery that they elide epistemic hegemonies and refuse any pre-figured methodological designs. How might physio/logical knowledges participate in/as data, with methodologies concerned with situated knowledge effects, co-created consequences, non-representational entanglements, and non-reproducible involutions (Holmes & Jones, 2013; MacLure, 2013a; McCoy, 2012)?

Doing: Documenting (and seeing) with physio/logical knowledges. As Carly and I debated how we might get the damp muddy buddy to zip up in the documentation I am thinking with, I was struck by how inadequate my methodological tools for attending to this moment were. I needed both hands to tug at the zipper, making camera holding an impossibility – as the moment seemed so routine, my camera was packed in my backpack anyways. More importantly, I wondered how I might document with Carly’s sock-clad feet as they became trapped against the sticky wet ankle holes of the muddy buddy, with my frozen fingers as they unhelpfully tried to straighten the twisted legs of the muddy buddy, and with Carly’s frustrated full-body sighs as we realized that we had made a misjudgment somewhere in our thermal layers + waterproof outer shell estimation. I can attend to some palpable features of the moment (how hard my fingers need to pull against the muddy buddy to get it untwisted) but not others (the molecular muscle proteins that make these finger movements possible). I can try to recount all the variables at play when a body does not fit into a muddy buddy (it is too wet, too narrow, Carly’s pants are too thick) but that fails to actually attend to how I might document with physio/logical

knowledges. My practices of attending, the words I might use, and photographs are partial, limited methods of seeing and documenting. I understand the limits of my ability to document as cues that my frames of reference are limited, and instead of dwelling on this, I use these inadequacies to make my methods for noticing and recounting vulnerable *with* physio/logical knowledges.

For example, my description of this moment is highly visual. As Haraway (1988) elaborates, Euro-Western representationalism assumes a universalized visioning, where what has been made representable/ed must endure, via some epistemological coagulation (or, policing), in line with a ‘correct’ hegemonic positivist sense of perception. Arguing that “it matters what thoughts think thoughts. It matters what knowledges know knowledges. It matters what relations relate relations. It matters what worlds world worlds. It matters what stories tell stories” (Haraway, 2016, p. 35), Haraway dismantles vision’s entanglements with representational habits. Haraway makes clear that any assumption of enduring representability is rooted in a refusal to attend to the partial politics of generating knowledge. From Haraway, I know that vision is partial because it privileges certain epistemic conventions for making meaning of what a human can perceive and how a human should perceive. How though, does vision unfold partially with physio/logical knowledges?

Incorporating a physio/logical knowledge, I notice a too-small muddy buddy because of microscopic muscle proteins that make my extraocular muscles contract and focus my eye; when I ‘see’ the zipper of Carly’s muddy buddy, I am looking – generating knowledge – with six eye muscles (Moore, Dalley, & Agur, 2010). These muscles are nourished by cellular metabolic substrates mined from the food I consume, they are innervated and activated by ions, and they fatigue at a rate that I cannot dictate (Martini, Timmons, & Tallitsch, 2009). My gaze – my

ability to document and represent this moment with visual practices – is profoundly entangled with extraocular muscles, which are made perceptible, in one specific way, by a physio/logical knowledge. My documentation practices in this moment emerge at the nexus of my privileged Euro-Western ways of seeing (I am reasonably confident that no one will tell me that I did not ‘correctly’ see a muddy buddy and a child), physio/logical knowledges, six real material eye muscles (and the metabolic cycles they rely on), and a post-qualitative attention toward engaging all of these entities as active constituents in my documentation methods. This raises a critical question for thinking post-qualitative interventions into documentation: when I describe what I see with physio/logical knowledges, what am I describing with?

My integration of physio/logies here does not serve to simply add a Physiological lens to Haraway’s (1988), and post-qualitative critiques, of how vision, representationalism, and positivism form a nexus of epistemic hegemony. Documenting with eye muscle physio/logical knowledges, I am not asserting that my bounded, stable, correct vision practices are facilitated by what I am certain are six eye muscles that Physiology can entirely describe. Rather, I draw in physio/logical knowledges attuned to extraocular muscles as another layer for documenting with physio/logies. This does not make my documentation practices ‘better’ or more accurate. Instead, allows me to complexify debates on truth and representationalism in documenting, as I pull in one physio/logical knowledge amid innumerable ways of knowing flesh and vision. I can rewrite my reflection, not to better ‘see’ the moment, but to make clear how my documentation practices with flesh are profoundly limited: *I watch (as six muscles, activated by ions and sustained by calories, collaborate to focus my eyes that have been taught to see correctly in an epistemic tradition that privileges Euro-Western consistency) as Carly pushes (I write this as ‘push’, because I felt the muddy buddy fabric rapidly tense against the force of her foot) her legs into*

her muddy buddy, which is still wet , from yesterday and asks for my help closing its waist-to-neck zipper.

Thread Two: Accountability, Answerability, and Euro-Western Physio/logies

Post-qualitative research is not an invitation to wildly experiment with generating knowledge for the sake of proliferation. When post-qualitative methodology becomes a generative ontological problem, Euro-Western methodological practices of decentering the human (Pacini-Ketchabaw, Taylor, & Blaise, 2016) and dismantling humanist habits of thinking method as pre-articulable (Springgay & Truman, 2017) become imbued with accountability. As St. Pierre (2013a) details, “deeply embedded in the new ontology are ethical concerns that acknowledge the destruction of the world humanism and its science projects encourage with their man/nature, human/nonhuman binaries” (p. 655). As such, I understand post-qualitative research as an uncertain, ethically complex (and contested/contestable) intervention into colonial academic and methodological customs.

Answerabilities and accountabilities. This post-qualitative push to make perceptible how methodological entanglements matter as accountabilities reverberates with feminist science studies’ attention to the politics of Biological/Scientific knowledge generation. Haraway (1988) explicates situated knowledges as modes of becoming “answerable for what we learn how to see” (p. 538), where practices of crafting Sciences and empiricisms and making liveliness perceptible must always be able to be called to account. Taking up Haraway’s call for accountability, feminist science studies scholars have differentially elaborated how estrogen receptors and protein otherness (Roy, 2007), synthetic biology and poem-containing bacterial genomes (Roosth, 2017), and vole genetics and molecular monogamy (Willey, 2016) beget answerabilities capable of disrupting the epistemic hegemony of the Euro-Western Scientific

canon. These feminist scientists take seriously critiques of the constructed partiality of Scientific experimentation, but rather than becoming stuck in this mode of critique, they delve into the complexities of imagining how these sciences might become accountable to the lived consequences they create. Haraway's situated knowledges and Willey's (2016) call to generate "nuanced and careful narratives about relationships between feminism, science, and the body [that] enable the work of producing newly accountable knowledges about the materiality of the naturecultural world" (p. 22) are methodological practices that center concerns of answerability and accountability.

These feminist science studies scholars enliven Lather's (2012) post-qualitative push to interrogate "what kind of science for what kind of politics" (p. 1021) by considering how, in working these sciences to account, expansive ontological grapplings, tentative engagements with material attunements, and vulnerable descriptions of imperfect methods might matter as methodologies for unsettling Scientific supremacy (Haraway, 2016). Thinking physio/logy methodologically with post-qualitative education research, then, becomes a provocation of answerability. I must trace how putting physio/logical knowledges into conversation with post-qualitative methodologies might make Physiology answerable to the ethico-onto-epistemological demands of post-qualitative inquiry.

Doing: Making Physiological entanglements public. How then, does Physiology become answerable with post-qualitative methodologies in the muddy buddy moment? If thinking physio/logy methodologically entails a provocation of accountability, then I must first make public how Physiology informs my methodological habits in this moment. For example, I begin my written recollection by situating our bodies within a damp, chilly day. I could potentially think of environmental dampness and chilly air temperature from a variety of

theoretical positions, with a variety of methodological orientations. I might trace how children move with weathering (Rooney, 2016); I could interrogate how dominant Euro-Western developmental discourses position children as vulnerable and muddy buddies as adult-mandated protection against the elements; or I can follow the production lines of human and ecological capital that muddy buddies are made within. However, my emphasis on these weather conditions ties to a physio/logical knowledge of cold virus Pathophysiology, which is built upon an understanding that immune system responses to common cold viruses are reduced below certain body temperatures (Foxman et al., 2015). Physiology taught me that chilly environments lower body temperatures and when bodies get too cold, they become more susceptible to catching viruses. Therefore, damp and brisk weather demands my attention.

Springgay and Truman (2017) detail how post-qualitative “methods are generated both as a means to produce, create, and materialize knowledge *and* practices of dispersal, collective sharing, and activation of knowledge *at the same time*” (p. 9). If my methodological practices concurrently activate and materialize knowledges, it matters that I make clear how my methodological intentions are informed by physio/logical knowledges. When I foreground chilly damp environmental conditions for physio/logical knowledge reasons, any modes of attention/methodological practices and knowledge/conclusions/reflections I might generate are entangled with the epistemic histories of Physiological inquiry. As Physiology is a tool of colonial epistemic hegemony, noticing how my methods for attuning to, and recounting, moments reassert Physiological concepts is an ethical tension, not a practical problem. When I make overt how physio/logical knowledges matter in my methodological practices in this moment, the realm of things I can attend to and produce knowledge with becomes specifically delineated: *Eight children, one educator, and two researchers are preparing to head outside to*

the forest on a chilly, damp morning and I am noticing that the air is chilly and damp because I am thinking with rhinovirus, immune responses, and body temperatures.

Translating this into a question of answerability, what methodological practices are possible and impossible when I center a dampness intertwined with Physiology? Thinking physio/logical knowledges in a methodological space where any essentialist researcher subjectivity is profoundly decentered (Mazzei, 2013b) means that methodologies must become answerable to different, unfamiliar conceptions of rigour, utility, and justice-to-come (Barad, 2007). This raises questions of how I can make my attention to physio/logical knowledges answerable to multiple layers of consequence; noticing dampness because of cold viruses is not an apolitical decision. Because I put stock in a Physiological explanation of body temperature and cold viruses, I attended to dampness. Because I noticed dampness, I centered my focus on the material complexities of the dampness-preventing muddy buddy – what did I ignore? More importantly, what epistemic traditions am I insidiously or intentionally furthering? How can I become accountable for what I ignore or obscure (or destroy) when I focus on damp and chilly air because of a physio/logical knowledge?

Thinking physio/logy methodologically with post-qualitative research, I have detailed how the concept of physio/logical knowledges and an orientation toward answerability might matter with practices of disrupting inherited humanist ontological and research conceptions of truth, positivism, representationalism, and ethics. I turn now to wondering how the ‘physio’ of *physio/logy* might unfold methodologically with post-qualitative research.

(Posthumanist) *Physio/logy*:

Questions of flesh and bodied materiality constantly complexify post-qualitative methodologies. When post-qualitative research foregrounds an intention to think bodies and

lively bodied knowledges without humanisms, scholars frequently turn toward posthuman theorizations of life, knowledge, matter, and inquiry (Holmes & Jones, 2016; Ivinson & Renold, 2016; Pacini-Ketchabaw, Taylor, & Blaise, 2016). As Taylor (2016) elaborates, “posthumanist research practices offer a new ethics of engagement for education by including the nonhuman in questions about who matters and what counts in questioning the constitutive role played by humanist dominant paradigms, methodologies and methods” (p. 5). Posthuman methodological practices – which are plural, uncertain, and non-generalizable – actively confront inherited anthropocentric methodologies, while attending to methodology as an ongoing process of worlding. These methodologies do not argue that all humans are (or should ever be) posthuman, or that all bodies or political projects can or must invest equally in undoing humanisms. Rather, posthuman methodologies in education research are specific, tentative, and partial interventions into the Euro-Western modes of inquiry that bound bodies in method. They work, as Taylor and Hughes (2016) describe, at ‘unlearning’ what Euro-Western ontologies have taught us (or me, or Euro-Western settlers) to know as real or rigorous, as flesh or bodies.

Where humanist methods might engage bodies interpretatively by asking how we can decode what a gesture, a racing pulse, or a flux of estrogen means, posthumanist inquiry might ask how muscles, heartbeats, and hormones do methodology. While humanist methodologies critique Physiology for its essentializing habits, posthuman methodologies might wonder how physio/logical knowledges can be lived at their edges, finding messy methodological joy in the moments when inherited epistemologies enter a space where stable methods, anthropocentric conceptions of subjectivity and knowing, and the inertness of flesh become impossible. How, then, can bodies, and the physio/logical knowledges that thread through flesh, matter with posthuman, post-qualitative education research practices?

Thread Three: Vulnerability, Uncertainty, and Flesh

Post-qualitative research often interrogates how bodied knowledges intertwine with modes of inquiry by interrogating how new empiricisms matter methodologically (Clough, 2009; St. Pierre, 2015b, 2016; St. Pierre, Jackson, & Mazzei, 2016) amid feminist new materialist theorizations of “materialist, relational, co-constitutive, affective, vitalist, corporeal notions of experience which foregrounds entanglements” (Taylor, 2017, p. 313). Putting to work Barad’s (2007) agential realist ethico-onto-epistemology, post-qualitative research wonders flesh in its material-discursive generativity as a response to classical humanist empiricisms that posit bodies as an ontologically stable and rationally knowable object to be studied. As such, bodied knowledges are frequently foregrounded as a response to linguistic representational hegemonies (MacLure 2011, 2013b) that prioritize essentialist understandings of discursive purity over the messy and differently-comprehensible interjections of bodied materiality. Thinking with Barad, Mazzei (2013a) details how post-qualitative experimentation can “attempt to account for the body that is always already in the work [through]... a shift from focus on epistemology to one of ontology, or onto-epistemology” (p. 779). Mazzei argues that researching with flesh requires following how flesh is always active in practices of inquiry in ways that already unsettle humanist distinctions between animate and inanimate, human and non-human. This pulls engagements with flesh away from logics of anthropocentric epistemologies or essentialist logics, and toward considerations of how flesh matters ontologically, actively, and unfamiliarly in education research.

Reading physio/logies alongside Barad (2007), flesh is made to matter with/as/in material-discursive entanglement(s). It becomes possible (and necessary) to think physio/logy as a series of coalescing tangles of, among an ethico-onto-epistemological multitude of other

actants, inherited humanist logics, tissues that cohere as a human body, and microbial agencies that unsettle what might count as life, *while also* making a political choice to foreground the material contours of bodies in inquiry. That is, with Barad, flesh cannot not become everything and everything does not become flesh, nor are bodies inherently methodological or methodologies enduringly bodied. Physiology – and physio/logical knowledges– are never hypothetical or abstracted, especially as they do methodology.

Matters of physio/logies. I think with Barad (2007) to articulate matter(s) of physio/logies. Physiology is consequential in flesh, and physio/logical knowledges are relevant to how muscles, fats, and skin become perceptible. I refer to these differential material discursive physio/logies, and these real bundles of tissue that profoundly impact life, as matters of physio/logies. I emphasize the ‘matter’ of physio/logies to stress that “ethical practices emerge from material realities, and to ignore the materiality of bodies is to ignore the significant social injustices that accompany bodies” (Warin, 2015, p. 63). Matters of physio/logies are crafted of “practicalities, materialities, *events*” (Barad, 2007, p. 13) that make perceptible “how the body’s materiality—for example, its anatomy and physiology—and other material forces actively matter to the processes of materialization” (Barad, 2003, p. 821). Matters of physio/logies might be perceptible as eye muscles, muddy buddies, cold viruses, damp air, and Physiology textbooks.

Jackson and Mazzei (2016) describe how posthuman inquiry practices require that methodologies shift from attending to “a human (ie: contextual) experience of matter to the vibrant matter animating an agential assemblage” (p. 95). This pulls in questions of representational epistemologies, partial physio/logical knowledges, and tuning to consequence, because attending to matters of physio/logies methodologically becomes a practice of noticing how flesh is made perceptible in ways familiar and unfamiliar to dominant humanist frames of

reference. Doing matters of physio/logies with post-qualitative methodologies then, might entail intentionally thinking flesh with inherited physio/logical knowledges, and then rather than attending to how flesh conforms to this frame, noticing how matters of physio/logies quietly unsettle the epistemological systems that allow for these inherited knowledges to materialize even temporarily.

Doing: Conversations with/and physio/logies. Lather and St. Pierre (2013) propose that post-qualitative research might “think a ‘research problem’ in the imbrication of an agentic assemblage of diverse elements that are constantly intra-acting, never stable, never the same” (p. 630). Extending this into thinking matters of physio/logies methodologically, how might I inquire with the material agencies that animate bodies when doing so requires that I abandon any positivist assumption of their functionality? For MacLure (2016), post-qualitative “analysis still does not really know what to do with the matter that lies on the borders of language, body, and the virtual – tears, laughter, hiccups, fidgeting, silence – to which it makes little sense to respond: *What does this mean?*” (p. 180). Putting MacLure’s contention into conversation with matters of physio/logies, I must ask questions of how cellular interactions, biochemical systems, and anatomical cooperativity come to complicate research practices so profoundly that I often must refuse to fully respond to them in order to maintain any semblance of ‘inquiry’ or ‘methodology’. How might I take matters of physio/logies’ interjections as literal interventions in the inquiries we practice?

In the muddy buddy moment, Carly asks me why she needs to wear a muddy buddy. Thinking methodologically, I recount this moment as a conversation between Carly and myself, and I describe my verbal response. I foreground our words and our interaction as data, and my response gestures to the more-than-human conditions outside the classroom while centering

Carly's body and my understanding of outdoor conditions. In tuning in to our conversation, I have made a methodological choice to ignore many other participants in this moment: the material-discursive conditions that culminate in the 'necessity' of children bundling their bodies in muddy buddies, the soil and rainwater clinging to the muddy buddy that is collected from an urban forest that the children often visit on unceded Indigenous territory, and early childhood education practices that create power dynamics where Carly feels I might know better than her why muddy buddies are needed.

As I kneeled beside Carly in the mudroom, I focused on our conversation because of a physio/logical knowledge. I had noticed how Carly was a little bit out of breath from quickly pulling on an extra pair of fuzzy sweatpants, a puffer vest, and a fresh pair of socks. I zeroed in on Carly's words because they were hoarse and this made them feel important. Drawing in a physio/logical knowledge, I might debate how (human) speaking unfolds. Physiology would explain that lungs push a puff of air toward a larynx, where vocal chords vibrate with the air pressure and the vibration of this flesh generates sound, which lips and tongues shape into words (Unglaub Silverthorn, 2007). I might, then, attend to how air and the muscular work of my cheeks participates in my conversation with Carly. Taking inspiration from Mazzei's (2013b, 2016), and Mazzei and Jackson's (2016), reimagining of voice beyond bounded humanist subjectivities, this might disrupt any easy humanist framing of our conversation, as I can trace how different materialities interject in our discussion.

However, thinking matters of physio/logies with post-qualitative research involves more than simply adding Physiological concepts to education research. Lather (2013) argues that, to unsettle the positivist imperatives of inherited humanist knowledges, post-qualitative methodologies should focus on "working the stuck places into which such tensions have gotten

us” (p. 642). To unsettle the positivist imperatives of Physiology, I need to seek collaborations between post-qualitative research and matters of physio/logies that actually make visible the ontological reductions required to frame Sciences, and these matters, as taken-for-granted (Willey, 2016). Borrowing from Lenz Taguchi’s (2016) neuro(n) concept as method, I propose that one strategy for doing matters of physio/logies methodologically involves inhabiting a physiology and tracing its contours from the inside – from its ‘stuck places’, in Lather’s words. This means that I can delve further into Carly’s and I’s conversation with physio/logy, working to find how matters of physio/logies complexify my tools for attending to voice or conversation as data – and, concurrently, complexifying my methods for engaging physio/logies beyond the positivist authority they are typically afforded.

Physiology might position Carly’s breathless voice as exercise-induced exertion (McArdle, Katch, & Katch, 2006). When muscles are challenged (by rushing back and forth to get boots, mittens, warm pants, and socks), muscles require more oxygen. Lungs respond by increasing their rate of activity, bumping up breathing rates, so that a heart can pump more oxygen to muscles throughout the body. With this physio/logical knowledge, Carly’s raspy question is a matter of physio/logies. My methodological attention to her words is implicated in a complex network of oxygen, lungs, muscles, damp outside air, muddy buddies, and physio/logical knowledges. When I foreground my conversation with Carly, what am I attending to? Carly’s muscular effort to push her legs into the twisted and clingy muddy buddy, the oxygen that is vented into the child care center, the tissues within Carly’s lungs that are straining to keep up with her body’s speed, vibrating vocal chords – these are all matters of physio/logies that participate in the ‘conversation’ I take as data. So too are Physiological concepts that frame voice with lungs and larynx and obscure non-Scientific resources for understanding speaking. With

matters of physio/logies, I revisit my original documentation: *As the educator hands each child their 'muddy buddy', which is a one-piece waterproof rain suit, the child that I, and oxygen and muddy buddies and lungs and vocal chords and cold air, have been chatting with, Carly, asks me why she needs to wear a muddy buddy.*

I focus on Carly's voice because it is raspy, as a matter of physio/logies Carly's breath happens with oxygen and lungs and muddy buddies, and this influences the ways I have of noticing, recounting, and generating knowledge with this moment. This practice walks a necessary, and very imperfect and entirely contestable, line of re-centering a Euro-Western knowledge (Physiology) while using a physio/logical knowledge to upset humanist research conventions (holding conversation as an intact data source). Thinking matters of physio/logies with post-qualitative methodologies double dips into inherited knowledge systems as I foreground contingent and situated matters of physio/logies, while knowing that I can only attend these specific matters because of how Physiology, physio/logical knowledges, and matters of physio/logies make these matters perceptible.

Thread Four: Bodies and Posthuman(ism) Physiologies

How can physio/logies unfold in bodies that we live as human(s), without humanisms? As I pour over the rich terrain of post-qualitative research, I wonder at the absence of direct confrontations of what it is to research with/in a body made of matters of physio/logies, physio/logical knowledges, and Physiology. Post-qualitative scholars do not shy from thinking bodied complexities methodologically: MacLure (2013b, 2016) attends to bodied interjections; Mazzei (2013b, 2016) together with Jackson (Mazzei & Jackson, 2016) imagines voice beyond bounded humanist subjectivities; and data analysis practices (Holmes & Jones, 2013; Mazzei, 2013b; Lenz Taguchi, 2013) become increasingly entangled with coughs, hair, and movement.

Still, I notice that an explicit engagement with what might be required to research with a specific body while refusing to submerge my/any body into the soup of branding it as Human, has not yet percolated through the post-qualitative and posthuman research collective. How might we think and do specifically material-discursive bodies methodologically? How can we inquire with bodies made partially perceptible with matters of physio/logies?

Expansively specific flesh. Feminist science studies scholars frequently inhabit bodies by foregrounding the complex intersections of flesh, human-centered politics, molecular material-discursive actants, and lively more-than-human worldings that infiltrate and organize bodies. Haraway (2016) shares stories of response-ability co-created with “conjugated estrogens [that] are about yoking molecules and species to each other in consequential ways” (p. 110). Alaimo (2010) illustrates how xenobiotic chemicals agentially invade the ‘normal’ thresholds of human bodies until bodies become made in transcorporeal tangles. Foregrounding “membranes [that] are of various types – skin and flesh, prejudgements and symbolic imaginaries, habits and embodiments” (Tuana, 2008, p. 200), Tuana (2008) articulates how bodies are made with/in complex contemporary worlds. Reading these more-than/posthuman feminist science studies bodied stories with education research raises questions of how I might intentionally disrupt methodological tendencies that maintain strict demarcations between bodies and outsides, human and nonhuman, while dipping into the knowledges that I generate while thinking within a body/ies. How might I research with flesh and bodies that are always Physiological, *and* with physio/logical knowledges and matters of physio/logies that are dispersed and posthuman(ist)? I research with/in a specific, but not neatly materially bounded or ontologically pre-given or epistemologically authoritative body: a body with muscles that carry Physiology textbooks that describe those muscles in ways that matter; a body with fat that is molecular, agential, and

uncontainable, *and* that becomes entangled with human-mediated microscopes, blood lipid levels, and the weight loss surgery advertisements that flood my Instagram; a white settler body that, owing to legacies of Enlightenment, is able to assume the privilege of being colonially human. What does this mean for how I can research with post-qualitative, posthuman methodologies?

Doing: Fleshed specificity as data. Thinking bodies methodologically with post-qualitative research and matters of physio/logies, I argue, requires that we question how present, lively, consequential anatomical arrangements (for example, my right index finger as I type an ‘I’ on my keyboard) become entangled with a specific physio/logical knowledge amid a particularly materialized matter of physio/logy to become of methodological concern. With MacLure (2011), thinking with the body in post-qualitative research means paying attention to “the questions posted by the irruption of the body into the abstraction of meaning [that] are unanswerable. Yet they cannot be dismissed. They produce, I think we could say, a kind of stuttering of interpretation itself” (p. 1002). Reading MacLure alongside the expansive specificity with which feminist science studies scholars engage the body, perhaps doing physio/logies with post-qualitative methodologies means never confining physio/logical engagements to human-centered qualities, working instead to mobilize flesh that has been made human in ways that might potentially unsettle humanisms.

For example, in the muddy buddy moment, I describe how Carly and I figure out that we are not going to be able to convince the muddy buddy to zip up; it is too small, too wet, she is wearing too many other layers, and we are both shivering. My shivering fingers and shoulders made my muddy-buddy adjusting movements less adept than they might typically be, and Carly’s shivering was tangling her body more with the muddy buddy. Methodologically, my

recollection invests in humanist and Physiological practices of understanding the human body as a relatively bounded entity worthy of research attention. My retelling positions this moment as important because it unfolds around Carly's body and prioritizes methodological practices that trace why or how Carly's body and the muddy buddy are not congruent. I might ask what materials make fitting impossible, and note how Carly's puffer vest and fleece pants interfere in our plans. With matters of physio/logies, I can expand upon what – vocal chords, lungs, germ-susceptible airways, legs, fingers – does not fit in the muddy buddy. More importantly, I argue, thinking this moment with posthuman theorizing requires that we do not ignore Carly's body or my body or any of the matters of physio/logies that interject in this moment. Rather, thinking physio/logies with post-qualitative, posthuman methodologies requires asking how physio/logies might contribute to building non-anthropocentric, non-positivist bodied methodologies. One such strategy for doing this is to ask how physio/logies foreground fleshed specificities, or the materially meaningful capabilities of being a researcher in a human body, as data.

Taking inspiration from MacLure's (2016) elaboration how bodied responses mark important interruptions in methodological practices, I focus on my shivering as a methodological intervention; as a bodied sense of data that participates in knowledge generation. However, in thinking about being a body entangled with physio/logies, I want to push further, with physio/logies, to unsettle the intactness of 'shivering': what does shivering entail? With Physiology, shivering is a reflex (Tansey & Johnson, 2015). One physio/logical knowledge knows shivering as an involuntary, very quick activation of muscles in response to an external stimulus of cold. Shivering, as such, is a fleshed specificity that my body as a matter of physio/logies researches with: my body automatically shivers when it is cold. When a body shivers with physio/logies, skeletal muscles throughout the body perform small contractions to

generate heat and raise a body temperature (Unglaub Silverthorn, 2007): the body that I research with/in warms itself up by making its hands shake and its shoulders shudder inward. Another physio/logical knowledge situates the neural control of shivering in the brain and traces nerve pathways from thermoreceptor cells spread throughout the body to the brain, and back to skeletal muscles (Tansey & Johnson, 2015): my fleshed research tool, my body, does shivering as a complex communication between multiple micro-structures I will never see or touch.

With physio/logical knowledges, shivering matters as a bodily interjection but not only because shivering interrupts my ability to grab a camera, write a field note, or pull a zipper. Taylor (2016) outlines how posthuman inquiry methods demand “plunging into particularity that collapses scale, structure and level – to (try to) see a world in a grain of sand, indeed – and a committed ethico-onto-epistemological venture to (try to) do away with the [neoliberal, Euro-Western] binaries” (p. 20). Shivering with physio/logies matters methodologically as a ‘plunge into particularity’. My shivers as I tug at the muddy buddy zipper are a specific pattern of muscled activity, my body’s response to locally circulating damp chilly air, and demand work of nerves, muscles, thermoreceptors, ions, and cellular energy that live beneath my skin. Shivering is something a human body does, but thinking with posthuman physio/logies, perhaps shivering becomes expanded beyond a bounded body frame of reference: my situated flesh shivers, but it is not ‘Shivering’ (the concept, the Physiological explanation) in and of itself that is of methodological import, it is how shivering unfolds with a cascade of cellular, environmental, and bodied actants. Shivering is, at once, fleshed, specific, and expansive. I revise my initial documentation: *Shivering (the work of a complex system of neural communication below my skin), I tug at the plasticity fabric (my fingers are tense, their skeletal muscles shaking rapidly to*

warm themselves up) to try to align the twisted zipper, Carly takes a big (shivery?) breath in and yanks at the zipper pull, and we quickly realize that this muddy buddy is not going to cooperate.

Doing Physiologies Methodologically

In this article, I have argued that post-qualitative education research can engage with physio/logy, as constructed by feminist science studies, with generative, non-essentialist, answerable methodological practices. I have traced how putting the ‘logy’ of physio/logy into conversation with post-qualitative research practices generates physio/logical knowledges as plural, uncertain, and more-than-representational epistemic practices concerned with answerability and accountability. With the ‘physio’ of physio/logy, I have imagined how matters of physio/logies might entangle with post-qualitative attunements to flesh and how orienting toward expansively specific posthuman flesh might create space for thinking differently with how bodies happen with/in education research. At the heart of this discussion lies my contention that post-qualitative research *should* engage Physiology. Grappling with what might be required to think physio/logical knowledges with accountability matters because knitting physio/logies with post-qualitative intentions might contribute to the vast task of unsettling of humanist modes of inquiry while intensifying the methodological tensions of thinking with flesh. This, as I have detailed, carves space for generative multidisciplinary collaborations between feminist science studies and post-qualitative research, and – perhaps more importantly – marks one small, partial, tentative intervention into the colonial epistemic authority ascribed to Physiological Sciences and Euro-Western epistemic and methodological hegemonies.

Throughout this article, I have revisited a piece of documentation from a pedagogical inquiry research project. Working this documentation differently with four post-qualitative + feminist science studies methodological tangles, I have created a bundle of data capable of

participating in different methodological and knowledge-generating conversations than in its original iteration. I do not intend to position this version as ‘better’. Rather, to conclude this article, I present this documentation as an exploration of how I might do physio/logics with post-qualitative methodologies:

Eight children, one educator, and two researchers are preparing to head outside to the forest and I am noticing that the air is chilly and damp because I am thinking with rhinovirus, immune responses, and body temperatures. As the educator hands each child their ‘muddy buddy’, which is a one-piece waterproof rain suit, the child that I, and oxygen and muddy buddies and lungs and vocal chords and cold air, have been chatting with, Carly, asks me why she needs to wear a muddy buddy. ‘It is rainy outside, and I am worried that your body might get too cold without a muddy buddy’, I answer. I watch (as six muscles, activated by ions and sustained by calories, collaborate to focus my eyes that have been taught to see correctly in an epistemic tradition that privileges Euro-Western consistency) as Carly pushes (I write this as ‘push’, because I felt the muddy buddy fabric rapidly tense against the force of her foot) her legs into her muddy buddy, which is still wet from yesterday and asks for my help closing its waist-to-neck zipper. Shivering (the work of a complex system of neural communication below my skin), I tug at the plastic fabric (my fingers are tense, their skeletal muscles shaking rapidly to warm themselves up) to try to align the twisted zipper, Carly takes a big (shivery?) breath in and yanks at the zipper pull, and we quickly realize that this muddy buddy is not going to cooperate. We cannot close this zipper.

Preface to Article 2

In this article, I work through two propositions aimed at taking physiological knowledges to account with post-developmental pedagogies. I shift the methodological terrain I outlined in Article 1, where I detailed how I might stick with physio/logy while not lending Physiology the epistemic power it is typically afforded in education research, toward a focus on pedagogy. I confront Physiology from two intertwined fronts: (1) as a Euro-Western knowledge that informs, and is made perceptible in line with, colonial and neoliberal state-sanctioned valuations of bodies, childhood, education, pedagogy, and physical activity; and (2) as a knowledge that post-developmental pedagogies can take to account by generating problems and provocations that hold physiological accountable with/to pedagogical complexities. This article is intended for a critical physical education audience, which informs my decision to think with the Canadian Society for Exercise Physiology and ParticipACTION's *Canadian 24 Hour Movement Guidelines for Children and Youth* (2016) – a well-lauded document that personifies the prevailing pedagogical understandings in this field. Documentation or analysis from pedagogical inquiry work is not present in this article, as I anchor my articulation of how post-developmental pedagogies can take physiological knowledges to account in a sustained engagement with the *Guidelines* to lend a physical education audience a common touchstone.

In the first half of this article, I provide an analysis of how Physiology exerts power as a Euro-Western knowledge, how Physiology is utilized to promote normative neoliberal conceptions of health, and how Physiology entangles with mainstream pedagogical resources. This analysis sets up the latter half of the article and outlines the context for my practices of 'claiming' physiological knowledges with muscle(s) and fat(s) in Articles 3 and 4. Articulating a pedagogical process that I draw upon in Articles 3 and 4, I use the second half of the article to

demonstrate how post-developmental pedagogies can take one specific physiological knowledge, present in the *Guidelines*, to account.

Importantly, as I work to craft physiological knowledges as situated problems with pedagogies, while generating pedagogical provocations that might hold Physiology accountable to answerabilities beyond the criteria Science lays for itself, I act on the discussion of politics and ethics outlined in my dissertation introduction. This article owes to Willey's (2016) call for settlers who benefit from Scientific epistemologies to 'claim' and actively unsettle the power of predominant Euro-Western knowledges, while recognizing the necessary limits of such a project. Throughout the article, I heed Haraway's (2016) assertion that "it matters what thoughts think thoughts. It matters what knowledges know knowledges. It matters what relations relate relations. It matters what worlds world worlds. It matters what stories tell stories" (p. 35). Willey and Haraway, and the many scholars concerned with the boundaries and violences of Euro-Western interventions into Euro-Western structures (Ahmed, 2008; Roy & Subramaniam, 2016; TallBear, 2015; Asberg, Thiele, & van der Tuin, 2015; Todd, 2016), teach me that it matters how I hold matters of accountability accountable, and to whose account(s) I am accountable. It matters *how* I take physiological knowledges to account, *with* feminist science studies, *with* post-developmental pedagogies, *with* the partial politics and ethics I work toward. This article takes up this how, with a physiological knowledge that has fascinated me since I first met it during my undergraduate degree, as I provide one small, partial practice of working physiological knowledges with post-developmental pedagogies toward answerabilities that might unsettle the epistemic authority Physiology holds in predominant Canadian physical activity pedagogies.

Article 2.

EPOCing with Physical Activity Pedagogical Resources – or, how might Pedagogies hold Physiological Knowledges to Account?

Abstract

Thinking with a Canadian physical activity pedagogical resource, this article proposes that post-developmental pedagogies can engage with Physiological Sciences beyond the instructive or instrumental relationships currently facilitated by contemporary physical activity pedagogies. To begin, I bring feminist science studies together with post-developmental pedagogies to detail how pedagogy and Physiology become intertwined. I trace the tensions of weaving physiological knowledges with pedagogies, acknowledging the power-laden complexities of thinking with Euro-Western Sciences in Canadian education. Finally, I work through two propositions of a pedagogical practice aimed at making physiological knowledges differently answerable to the complexities of post-developmental pedagogies: (1) crafting physiological knowledges as a problem with pedagogies, while (2) deploying these physiological knowledges as pedagogical provocations that can hold physiological knowledges accountable.

Keywords: post-developmental pedagogies, physiological knowledges, feminist science studies, physical education

This article proposes that post-developmental education pedagogies can take Physiological Sciences to account in an effort to unsettle the hegemonic stability of predominant physical activity pedagogies underpinned by Scientific epistemologies. I begin by discussing how Physiology, as a powerful Euro-Western knowledge, perpetuates colonial epistemic hierarchies and maintains neoliberal conceptions of normative, individualized ‘health’. Digging into how Physiological Sciences, practices of mainstream physical education, and early childhood education pedagogies become entangled in contemporary Euro-Western worlds, I turn to a Canadian physical activity pedagogical resource, the Canadian Society for Exercise Physiology (CSEP) and ParticipACTION’s *Canadian 24 Hour Movement Guidelines for Children and Youth* (2016a). I trace how Physiology and pedagogy become intertwined in this resource and detail how these Physiology-pedagogy entanglements enable specific educational practices. After locating my pedagogical intentions amid post-developmental pedagogies theorizing, I outline some tensions, which I grapple with through the article, of taking physiological knowledges to account with pedagogies.

In the second part of the article, I put forward one attempt at working a physiological knowledge to account with early childhood education pedagogies. Following Willey (2016), a feminist science studies scholar, I formulate a partial “vision of what it might look like to politicize scientific knowledge production in a way that allows for an answerability, an accountability, beyond the realm of internal critique that science as we know it lacks” (p. 14). I think with one physiological knowledge that underpins the *Canadian 24 Hour Movement Guidelines for Children and Youth*: excess post-exercise oxygen consumption. Translating Willey’s (2016) proposition into early childhood education, I argue that early childhood education pedagogies can engage, think, and ask questions *with* excess post-exercise oxygen

consumption beyond the interpretative or instrumental frames that typically inform how pedagogies and Physiology converse. I work through two propositions that bring post-developmental pedagogies and physiological knowledges together: (1) crafting physiological knowledges as a problem with pedagogies, while (2) deploying these physiological knowledges as pedagogical provocations that might hold physiological knowledges accountable. Throughout this article, I make the necessary contractions of my work public, as I detail my situated, small intervention into how specific physiological knowledges become entangled with specific pedagogical practices in Euro-Western Canada. I argue that working physiological knowledges to account with post-developmental pedagogies might make Physiology differently answerable to the multiple critiques that nourish post-developmental education while creating differently accountable practices of relating with physiological knowledges.

Detailing Physiology as a Euro-Western Knowledge

Physiology – as one knowledge production apparatus of Euro-Western settler colonial epistemic hegemony (Roy & Subramaniam, 2016; Sanabria, 2016; TallBear, 2013; Whitt, 2009; Willey, 2016) – is the Science of how a living body functions. As a Euro-Western knowledge system, Physiology sustains a specific scheme of bodied regulation. Physiology is utilized to dictate criteria for normative and legitimate bodied subjectivity, which translates into governmental constructions of citizenship and personhood, which can be achieved through individualized predictable, quantifiable behaviors (Guthman, 2013; Herndon, 2005; Kendrick, 2011). While an exhaustive survey of the myriad methods that Physiology utilizes as a tool of neoliberalism is beyond the scope of this article, taking inspiration from many outlines of how Science unfurls itself as a technique of governance (Haraway, 2013; Harding, 2006; LeBesco, 2011; Whitt, 2009), a summary would proceed as: Physiology functions amid truth-driven

ontologies by making biochemical agencies and flesh visible in strategic, quantifiable ways (for example: lean muscle mass), which are then classified as normative or pathological based on Euro-Western state-endorsed understandings of race, health, function, and disease (lean = healthy) which then translates into socially-sanctioned criteria for subjecthood and bodied legitimacy (people with lean bodies are desirable citizens). This creates a recursive system, where Physiology makes visible a biochemical mechanism or measure as consequential (lean muscle mass), thus sustaining the need for Physiological inquiry in order to ensure the optimal normative functioning of said mechanism (we need to fully understand lean muscle mass Physiologically, to ensure more people can work toward gaining lean muscle mass).

In Canada, Euro-Western epistemological traditions, Physiology, and neoliberal interventional logic form a band of settler colonial oppression targeting Indigenous and minoritized communities (Allan & Smylie, 2015; Reading & Wien, 2013; Smylie & Firestone, 2015). This leads to a multitude of Physiology-validated (and sustaining) intrusions, including interventions promoting ‘healthy’ physical activity, which act as thinly-veiled tools of reasserting settler valuations of bodied legitimacy, desirability, and citizenship (MacNaughton & Smith, 2016; Beausoleil & Ward, 2010; Rice, 2016). Physiological evaluations of ‘healthy’ or ‘ideal’ bodies position (male, physically able) white settler bodies as a ‘normative’ benchmark. This designates non-‘normal’ bodies as less legitimate and less desirable, thus lending a Science-based rationale to the historical and ongoing systemic oppression – murder, genocide, slavery, sterilization, relocation, erasure, program and funding disparities – faced by Indigenous peoples, immigrants, refugees, and people of colour. Physiology has been utilized to abstract ancestry to blood quantum, to rob reproductive agency based on skin colour or bone structure, and to maintain the validity of race-based genetic pre-dispositions to what is perceived as moral failing

or bodied weakness, such as epidemiological ethnic vulnerability to obesity, anemia, or substance use. Other bodies that are also deemed to differ from the non-innocent ‘normativity’ that underpins Physiology are impacted, differently, by this system of bodied valuation.

For example, in a statistic often adopted in media narratives, Statistics Canada (2016) uses body mass index criteria to explain that from 2011 to 2014, 27.9% of 12 to 17-year-old youth who identified as Aboriginal met standards for overweight or obese body composition, compared with 21.2% of non-Aboriginal youth. This Physiology-based statistic allows for Indigenous communities and people to be targeted, blamed, and categorized as at-risk, irresponsible, and/or expensive. It also centers a Physiological rationale that denies a more systemic analysis. Systemic analyses, including Mosby and Galloway’s (2017) discussion of how the denial of nutritious food to Indigenous children in residential schools links to the prevalence of type 2 diabetes in Indigenous communities, make clear how Physiological descriptions perpetuate systemic injustice by abstracting intergenerational oppression to ‘objective’ measures of Science-validated ‘health’.

Physiology and Pedagogies: CSEP’s Movement Guidelines for Children and Youth

Pedagogical resources that tout physical activity recommendations, outline physical literacy programming, and detail the necessity of educating young children in healthy nutrition habits are increasingly prevalent in Canadian early childhood education. These include the *Canadian 24 Hour Movement Guidelines for Children and Youth* by CSEP (2016a), *Healthy Opportunities for Preschoolers* by Temple & Preece (2007), and *Healthy Beginnings for Preschoolers 2–5* from the Chronic Disease Prevention Alliance of Canada (n.d.). The CSEP and ParticipACTION *Canadian 24 Hour Movement Guidelines for Children and Youth* (‘the *Guidelines*’) contain four core recommendations titled ‘sweat’, ‘step’, ‘sleep’, and ‘sit’. Related

to physical activity, the ‘sweat’ guideline outlines how long children should be highly active (“an accumulation of at least 60 minutes per day of moderate to vigorous physical activity” [p.2]) and ‘step’ details additional required physical activity (“several hours of a variety of structured and unstructured light physical activities” [p. 2]). The guidelines note that children and youth should follow these recommendations “for optimal health benefits” (p. 2). Targeted toward younger children, CSEP’s *Physical Activity Guidelines for the Early Years* (n.d) detail physical activity recommendations for toddlers, setting the developmentally-rooted groundwork for the *Guidelines*’ prescriptions for moderate to vigorous physical activity by recommending “progression toward at least 60 minutes of energetic play by 5 years of age” (para. 1).

Centering and Cementing Euro-Western Principles with Physiology

As these physical activity pedagogical resources gain traction with medical professionals, in policy, and in pre-service educator training, the ontological and epistemological underpinnings of the pedagogies, including those contained in the *Guidelines*, become insidiously obscured. Imbued with neoliberal conceptions of future citizens, personal responsibility, bodied legitimacy, and quantifiable educational attainment (Dahlberg & Moss, 2005), declarations that ‘early childhood education pedagogies must teach children the skills they need to be healthy’ or ‘pedagogies that promote fundamental movement skills and fitness are crucial for children’s healthy development’ become wrapped in affirmations of morality, care, and teleological learning that make them risky to contest. For example, the ParticipACTION (2016a) accompaniment to the *Guidelines* purports that reaching the recommended 60 minutes of activity can help children “improve their health”, “maintain a healthy body weight”, “do better in school”, “feel happier”, and “have fun playing with friends” (para. 13). These professed benefits invest in dominant developmental Euro-Western narratives of childhood as a period where

children gain the skills they need to become successful and valued citizens within a neoliberal state (Azzarito, 2009; Rich, 2011).

When physical education pedagogical resources are made indisputable, the background knowledges and practices that sustain their unquestionability are recursively bolstered. Complex material-discursive enactments (Barad, 2007) of ‘health’, ‘fitness’, ‘children’, and ‘teaching’ are framed as fixed, true, and common educational touchstones. The vast, lively, and deeply contestable knowledge-generating practices that underlie these pedagogies, including the Physiological Sciences that bolster mainstream conceptions of health and fitness, cannot easily become an accessible or worthy concern for pedagogical practice (Land & Danis, 2016; Petherick & Beausoleil, 2016; Rich, 2011). If posed, questions of why children should participate in prescribed physical activities are answered with a gesture toward evidence-based research, coupled with an assumption that the ontological supremacy of the Scientific canon negates any critical impulse.

Azzarito, Macdonald, Dagkas, and Fiset (2016) contend that neoliberal physical education curriculum obscures the complexities of moving bodies by ensuring that “specific bodies and identities in relation to the health discourse are normalized, celebrated, and legitimized in pedagogical settings (ie., school PE) through many acts of reinforcement and reiteration” (p. 7). In Canadian early childhood education, such practices of ‘reinforcement and reiteration’ include the ways that pedagogies (do not) allow for difference, critique, experimentation, and uncommon meaning making. For example, the *Guidelines* prescribe physical activity by frequency, intensity, type, and duration. When physical activity intensities are prescribed, they become easily translatable into universalized best practices for fulfilling these recommendations. The *Guidelines* recommend vigorous physical activity as one method

for achieving optimal health benefits. This serves to hold ‘optimal health benefits’ as an intact and universalized measure/concept, and borrowing Azzarito et al.’s (2016) language, a normalized, celebrated, and legitimate marker of pedagogical achievement. ‘Health’ becomes reiterated as a colloquial reminder (I chat with children about a ‘healthy’ choice), as a celebrated/legitimate pedagogical explanation (I choose to incorporate exercise because it is ‘healthy’ for children), and as a marker of normal/celebrated/legitimate bodies (I congratulate a child for moving or exercising their body very hard because they have made a healthy choice). This constant, multi-layered repetition draws a tight epistemological circle around ‘vigorous physical activity’ and ‘optimal health benefits’, while making the *Guidelines* difficult to engage beyond the pedagogies laid out in the document. These recommendations subscribe to a pedagogical project of promoting Euro-Western understandings of health, thus devaluing alternative conceptions of wellbeing. This ensures that the *Guidelines* endorse pedagogies that promote romanticized Euro-Western conceptions of childhood, which silences alternative understandings of childhood, education, and bodies. In turn, the guidelines strategically delimit the possibilities for thinking physical activity pedagogically as pedagogies must properly teach physical activity in order to produce healthy children.

Concealing how Physiology Entangles with Pedagogies

I argue that by curating the foundational features of physical activity pedagogies that can become subject to pedagogical purview, dominant physical education pedagogies ensure their educational authority and secure the dominance of settler-colonial onto-epistemological paradigms. When pedagogical resources are framed as well-founded and incontestable dictates (‘optimal health benefits’ can be achieved by following the *Guidelines*), debating the (Physiological, ontological, ethical) principles that underpin their content becomes unnecessary.

This, in turn, brackets the possibilities for critically engaging these pedagogies. For example, often the population of children who have participated in research or the physical location where research has been conducted is foregrounded in the publications that support/justify physical activity pedagogies. I argue that this is not simply a procedural product of following the conventions of mainstream Euro-Western academic inquiry. It actively delimits the aspects of pedagogical resources that might be contested (population-based critiques are made accessible, while the more ontological decisions that inform the research are not made as vulnerable). In highlighting this, I am focusing on how Physiological Sciences are not put at risk, and especially not beyond the conventional tools Science employs to critique itself (validity, reliability, methodology), in how pedagogical resources typically engage with Physiology.

There are a multitude of very important human-centered social justice critiques that make visible how these pedagogies are complicit in race, gender, fat, ability, and socioeconomic privilege-based oppression (Dagkas & Hunter, 2015; Evans & Penney, 2008; Flintoff, Dowling, & Fitzgerald, 2015; Hylton, 2015). For example, Azzarito (2009) details how high school physical education pedagogies systematically perpetuate highly gendered and racialized constructions of ideal 'fit' and 'healthy' bodies. Douglas and Halas (2013) outline how post-secondary institutions center white, Euro-Western physical education researchers which translates into a wealth of knowledge built of white, Euro-Western epistemologies, ontologies, and research biases. Analyzing physical education curriculum, Dowling and Flintoff (2015) trace how curriculum policies conceal white privilege and Euro-Western knowledges into seemingly universalized, normative discourses of health and fitness. I do not intend to critique the critiques of pedagogical resources. With a more explicit focus on complexifying Physiology-pedagogy entanglements, I want to emphasize that by making only certain concerns accessible for critique,

current methods for integrating Physiology with pedagogies strategical conceal other contestable features of these pedagogies. This, I argue, delimits the pedagogical possibilities for thinking movement, muscles, fitness, fat, and Physiology critically and creatively.

What if we foreground the foundational onto-epistemological assumptions, practices, and knowledges that underpin physical activity pedagogies? Willey (2016) proposes that “when we claim sciences, instead of ‘engaging’ them, the terrain shifts from one of how un/friendly feminists are to Science to one of what a world of sciences has to offer, where so much is at stake” (p. 146). Reading Willey’s argument with early childhood education pedagogies, I contend that early childhood education pedagogies can take physiological knowledges¹ to account, and contest Science’s onto-epistemological projects, by intentionally noticing physiological knowledges as a lively pedagogical participant. I propose that refusing to let Scientific assumptions hide behind physical education pedagogical resources might become a method for claiming, infiltrating, and taking to account how physiological knowledges entangle in problematic and productive ways with early childhood education pedagogies.

The *Guidelines* do not, in the form distributed to practitioners, make clear the Physiology that serves as the foundation for the recommendations. While it should be noted that the *Guideline Development Report for the Canadian 24 Hour Movement Guidelines for Children and Youth* by CSEP (2016b) is mentioned once in the preamble, in the *Guidelines* points like “an accumulation of at least 60 minutes per day of moderate to vigorous physical activity” (p. 2) are abstracted from the onto-epistemological customs that materialize their perceptibility. If the

¹ I use the language of ‘physiological knowledges’ to underscore that there are possibilities for thinking with physiologies that are not strictly Physiological Sciences. I turn to Landecker (2013) and the concept “fat knowledge” (p. 498) to think Physiology as physiological knowledge(s). With Landecker, rather than attending to what ‘makes’ Physiology, I interrogate the specific knowledge consequences of Physiology.

messiness behind this understanding of movement is concealed, the vulnerabilities it might hold are also made irrelevant to pedagogical concern. This allows for certain questions to become possible: who decides what counts as energetic play? How does this assessment devalue other forms of movement? How are gender, sex, race, ability, body size, access, and other power disparities addressed or perpetuated when ‘moderate to vigorous’ physical activity is recommended? While these questions are critical and important, the *Guidelines* make differently complex questions less accessible: what Scientific practices facilitate this temporal frame of 60 minutes? What Physiological conceptions make this ‘vigorous’ intensity matter, and how do these metabolic activities become imbricated in meaning making practices? If I do put stock in a recommendation for moderate to vigorous physical activity, how might the Physiological foundations of this recommendation – and the knowledges, bodies, and consequences they engender – mesh with my pedagogical intentions?

Intervening with/in Physiology

Taking Physiology to account with pedagogies, I confront singular, authoritative, and non-complex/complexifiable assertions of dominant Physiological Sciences as they matter in pedagogical resources and work to engage these knowledges beyond their claims to certainty. This article is certainly not the only project intervening with/in Physiology. Interventions in Euro-Western Science on an ontological level take up the practices of contemporary Sciences (Barad, 2007; Mol, 2002), argue that Science dis/invites critical engagement with interdisciplinary theorizations (Haraway, 2016; Kirby, 2011; Roy, 2016; Stengers, 2010; Wilson, 2015), and critique Science’s foundational dualisms and teleological logic (Grosz, 2011; Kirby, 1997). There are modes of living physiologies that refuse to lend Physiology or the Euro-Western ontologies it compels a single breath: Métis scholar Zoe Todd (2014) examines human-

fish relationships to detail how fish can be engaged within expansive relational frameworks lived by Indigenous peoples in Arctic Canada; Banu Subramaniam (2014) writes with flowers, tracing how her practices of plant physiology intertwine with different disciplines and gendered dynamics across India and America; vaginas are a site of Kanien'keha:ka refusal with Emily Coon (forthcoming), who thinks flesh beyond colonial gendered narratives of reproduction; and Kim TallBear (2013) theorizes genomic knowledges with Indigenous sciences and relationalities. From the biosciences come a multitude of feminist methodologies of doing science otherwise: tracing metabolisms (Landecker, 2011, 2013); heart feminism (Pollock, 2015); thinking fetal development as transdisciplinary relationality (Yoshizawa, 2012); and imagining epigenetics as obesity entanglements (Warin, Moore, Davies, & Ulijaszek, 2015). Physiologists craft publications that contradict what the field once took to be true, troubling the underpinnings of the field they have pledged to sustain. Feminist art interventions refigure what it is to live fleshed lives when Physiology matters, as Jessica Burke (2016) 'dresses up bones', Sarah Kay (n.d.) composes *Private Parts* with eyelashes and elbows, and Kara Taylor and Jennie Duguay (2016) write chronic illness into wholeness.

As I work to re-think how early childhood education pedagogies can engage with Physiology, I can know, and this article can take up, some of these interventions in Physiology. Other alternative possibilities for physiologies, flesh, and life remain necessarily imperceptible to my work. I take this unevenly-perceptible critical engagement as a making-real of Willey's (2016) plea to "recognize the importance of proliferating sciences (and not consolidating epistemic authority) to anti-imperial projects of worlding" (p. 145). To drag Physiology, post-developmental early years pedagogies, and feminist science studies into proximity in the Euro-Western conditions of contemporary Canadian education is an intentionally contested

pedagogical proposition. This incurs a great deal of epistemic privilege, as I am able to access Scientific knowledges. I assume that I, as a settler, can potentially disrupt settler structures – an assumption that is at once entirely contested by Indigenous and racialized scholars (Roy & Subramaniam, 2016; Todd, 2016), *and* is necessary if I want to be actively accountable to settler colonial consequences. I make the intentional decision to think with feminist science studies and post-developmental pedagogies theorists who are largely (although not entirely) Euro-Western scholars complexifying Euro-Western knowledge traditions. Without grandiose claims, I offer my work up to other projects that critique Science from a variety of ontological, epistemological, and methodological places, with the hope of working alongside them in this massive project of unsettling colonial hegemonies of Euro-Western Science.

Post-Developmental Pedagogies and Physiological Knowledges

Following from critical reconceptualist early years scholarship that has extricated pedagogy from universalized Scientific evidence-based prescription (Cannella, 1997; Dahlberg, Moss, & Pence, 2013; Kessler & Swadener, 1992; MacNaughton, 2000), post-developmental early childhood education orients toward pedagogical practices concerned with urgently inheriting the present complexities of contemporary worlds with children (Blaise, 2013; Lenz Taguchi, 2011; Rautio & Jokinen, 2015; Taylor & Pacini-Ketchabaw, 2015). Post-developmental conceptualizations of childhood begin from an appreciation of how stage-based theories of development, which claim that children reach adulthood through a series of universalized developmental milestones, privilege Euro-Western ontological and epistemological systems (Burman, 2016; Dahlberg & Moss, 2005; MacNaughton, 2003). By constructing both childhood and development as common, linear, predictable, and stable experiences, these scholars argue that Euro-Western developmental theories allow for precisely targeted education practices,

which service neoliberal conceptions of citizenship, individualized responsibility, and productivity. Alternative understandings of childhood or education are devalued and silenced by developmental narratives, which, in a global and settler colonial context, leads to the imposition of Euro-Western and neoliberal ‘normative’ expectations of childhood upon diverse children (Blaise, 2005a; Canella & Viruru, 2004; Pence & Pacini-Ketchabaw, 2008).

Post-developmental pedagogies contend that education, childhood, and development are ongoing and plural, and made through different practices, epistemologies, and ontologies (Blaise, Hamm, & Iorio, 2016; Pacini-Ketchabaw, Kind, & Kocher, 2016; Rautio, 2013). The post-developmental theorizing that I draw upon in this article positions education as a specifically-politicized, non-anthropocentric and humanism-refusing endeavor (Iorio, Hamm, Parnell, & Quintero, 2017; Nxumalo, 2016; Olsson, 2012; Taylor, 2013). In contrast to the stable human-centered conceptions of education facilitated by developmentalism, post-developmental scholars maintain that pedagogy, childhood, bodies, and learning unfold with a multitude of human, material (Dolphijn & van der Tuin, 2012; Lenz Taguchi, 2011; St. Pierre, 2015a), and more-than-human actants (Holmes & Jones, 2016; Mazzei, 2013; Pacini-Ketchabaw, Taylor, & Blaise, 2016; Rautio, 2017; St. Pierre, 2015b). These scholars dissolve developmental constructions of gender (Blaise, 2005b), literacy (Nxumalo, 2017), movement (Hackett, 2016), neurons (Lenz Taguchi, 2016) and individualized responsibility (Taylor, 2017) into complex, entangled, intentional, always ongoing pedagogical negotiations between children, adults, and place-based actants.

Physiology, and the physiological knowledges that enable developmental logics, can I argue, serve as rich sites of intervention for post-developmental pedagogies. Bringing post-developmental pedagogies’ insights toward my discussion of how Physiology and pedagogies

do, and might, become entangled, I argue that predominant relationships between Physiology and pedagogies, such as those in the *Guidelines*, can be reconfigured. When universalized physical activity recommendations lose their utility because the developmental assumptions underpinning them are made, to borrow from Haraway (2016), unthinkable, then inherited Physiological knowledges do not need to be buried under neoliberal curricula and Sciences do not need to be ascribed the explanatory power they are accustomed to. In the following section, I detail my practice for thinking post-developmental pedagogies with physiological knowledges while thinking with a physiological knowledge relevant to the *Guidelines*.

Doing Physiological Knowledges with Post-Developmental Pedagogies

I experiment with two propositions for working physiological knowledges to account with pedagogies: (1) taking physiological knowledges as a problem *with* pedagogy; while (2) generating pedagogical propositions wherein pedagogies might hold physiological knowledges accountable. I begin by detailing a physiological knowledge that participates in recommendations for physical activity intensity, excess post-exercise oxygen consumption (EPOC). I think with EPOC as a resource, selected due to its insidious presence in many physical activity guidelines including the *Canadian 24 Hour Movement Guidelines for Children and Youth*. I do not claim that EPOC is the only or the most important physiological knowledge that participates in the *Guidelines* – it is simply one physiological knowledge that matters.

Meeting EPOC

‘Oxygen Debt’ is the name EPOC colloquially introduces itself with (Hartree & Hill, 1922). EPOC, excess post-exercise oxygen consumption, is a loyal product of Exercise Physiology and is dedicated to theories of movement that understand biochemical energy as a system of carefully regulated and bounded consumption, exchange, and production. EPOC

logics, alongside many other physiological knowledges, lurk beneath recommendations for moderate to vigorous physical activity intensity. Oxygen debt needs to be earned, EPOC will tell us, by vigorous physical activity; it is the result of exercise work to exhaustion, muscled work that taxes aerobic energy systems and dips into anaerobic reserves when we feel our lungs scream (Borsheim & Bahr, 2003; DeLorey, Kowalchuk, & Paterson, 2003). The harder you work, the more EPOC you can earn (Crommett & Kinzey, 2004; LaForgia, Withers, & Gore, 2006; Yano, Yunoki, & Ogata, 2003). When we work our bodies via contracting our muscles, EPOC knows that we utilize metabolic substrates at the site of muscle contraction to the point of depletion, that lactate is generated as a byproduct of muscled work, and that body temperature spikes as an outcome of our effort – and, that these disturbances must be righted to maintain equilibrium, to restore homeostasis (McArdle, Katch, & Katch, 2006). EPOC realizes itself as the period where these disruptions are righted, where although our body has stalled its intentional, bounded bout of vigorous physical activity, a tremendous amount of oxygen is required to re-craft muscular energy stores, to oxidize lactic acid, and to compensate for an increased body temperature. Here is where EPOC plays its hero card: this post-exercise oxygen deficit, this need to shuttle oxygen throughout the body to repair cells and replenish energy stores even after you finish exercising, also taxes the body – it dips into fat stores and burns calories after you have ceased purposeful physical activity (Dorado, Sanchis-Moysi, & Calbet, 2004; Gaesser & Brooks, 1984). And, EPOC might posit, isn't burning bonus calories an interesting wrinkle in the quest to treat obesity and promote health and fitness?

EPOC as a Problem *with* Pedagogy

To pose physiological knowledges as a problem with post-developmental pedagogies, I invoke a specific conception of what it is to problematize or what it means to take as a problem.

While it might already be true that Physiology is a problem *for* pedagogy – ‘this set of movement guidelines says that children should be highly active for 60 minutes a day and I need to find a way to integrate this into my programming’ – to take physiological knowledges as a problem *with* pedagogies engenders a different ethic of problematizing. *How* might I make EPOC a problem with post-developmental pedagogies?

I understand that post-developmental pedagogies are always a practice, a labour, a doing (Hodgins, 2014; Pacini-Ketchabaw et al., 2016; Taylor, 2017). Stengers (2008), a feminist science studies scholar, emphasizes that “connections are something that must be created...this is the only way of succeeding in creating problems rather than receiving them readymade” (p. 9). Bringing Stengers together with post-developmental pedagogies, I make – enact, deploy, do – pedagogies with/in my intentional practices of creating EPOC as a problem with post-developmental pedagogies. Importantly, I do not want to create problems for the sake of problems. I need to generate “problems that are not to be solved but problems that need a different response” (St. Pierre, Jackson, & Mazzei, 2016, p. 105); problems that, as Stengers (2005) stresses “give to the situation the power to make us think” (p. 185). I need to generate knotted problems that cut across the ontological disjunctures of physiological knowledges and post-developmental pedagogies, and that reconfigure how post-developmental pedagogies can hold physiological knowledges to account.

Pedagogical problems of response with EPOC. EPOC engenders a logic of response: the harder an agential human exercises their muscles, the greater the demand on metabolic resources within muscles, more resources are consumed and must be regenerated, and thus a greater EPOC is created. I might pause this as an EPOC Physiology of responsivity, one loyal to a physiological knowledge of dose-response relationships (Altshuler, 1981). EPOC as response

enacts a physiological knowledge where stimuli interject in a body in a specific dose and the body then responds in a measured manner, predictably appropriate to the magnitude of the stimulus. Taking response EPOC physiological knowledges as a problem with pedagogy is to confront the ways this notion of response cuts across pedagogical practice: *how is the 'response' practiced by EPOC im/perceptible to the responsivenesses of pedagogy?*

Returning to the *Guidelines* to generate pedagogical problems with EPOC response logic, I need to trace the various 'responses' privileged in the pedagogy this document advances. EPOC and vigorous physical activity use a teleological, positivist, and predictable logic of response that captures response as a stable pattern – the harder you work, the more EPOC you generate. This extends into the *Guidelines* through both the recommendations made (60 minutes of vigorous activity a day for the most healthy bodied response) and the pedagogical practices that the *Guidelines* profess. For example, a ParticipACTION (2017) article with recommendations for educators states that “teachers can encourage physical activity and serve as positive role models” (para. 10). This assumes a specific form of response: children will respond to healthy educators by becoming active, and active bodies will benefit from increased physical fitness and health. I can borrow from post-developmental pedagogies that refuse a conception of curricular interactions located in linear or predictable logic (Olsson, 2012; Pacini-Ketchabaw, 2010) to take this straightforward assumption of responsivity as a problem of enabling different responses with pedagogy: how can I craft pedagogies that are hospitable to, practice, and can be interrupted by the methods and modes of responding that I value?

Post-developmental pedagogies also adopt experimental modes of responsivity, including response-ability (Haraway, 2015), thinking collectively (Instone & Taylor, 2015), (re)storying (Hodgins, 2014), or thinking diffractively (Davies, 2014). Post-developmental responsivity is not

a singular bounded, stable pattern. With EPOC dose-response logic, I can generate problems of response multiplicity: if I understand that pedagogical interactions are non-linear, and therefore refute or complexify the ‘easy’ pedagogical recommendation of role modelling, but I do invest in EPOC as a relevant knowledge, what modes of responding do the pedagogies I participate in make possible because of the ways that these pedagogies expect cells, lungs, bodies, and children to respond (differently – or similarly)? If EPOC response-logic matters to contemporary health discourses and generating modes of responding with children matter, how can I take up the messy spaces between answerability and dose-response relationships?

Pedagogical problems of transaction with EPOC. Transactional logic animates another EPOC physiology. EPOC is made visible as the exchange of oxygen for the release of stored muscular energy, as cellular metabolic substrates swap for muscular contraction and oxygen trades back to replenish muscled energy reserves (McArdle, Katch, & Katch, 2006). EPOC as transaction begets a specific problem of the kinds of transactions that are made perceptible to pedagogies: *how do EPOC transactions matter with pedagogical modes of exchange?*

EPOC employs a transactional logic that roots children’s motion, caloric deficit, and aerobic health in a metabolic transactionality reflective of modern economic systems – and, as Braidotti (2013) and Landecker (2013) assert, anxieties – where physical activity is exchanged for measurable health and development outcomes. In the *Guidelines* and their accompaniments, this transactionality is demonstrated in statements such as “children who get 60 minutes of moderate-to-vigorous physical activity per day are stronger, more confident, and less stressed” (ParticipACTION, 2017, para. 1). This is an easy, straightforward transactionality that when taken with post-developmental pedagogies that attend to how pedagogy is always emergent (Lenz Taguchi, 2011; Springgay & Rotas, 2015), generates questions of transaction coherence:

(how) can I reconcile or integrate linear conceptions of bodied metabolic transactions with an understanding of curricular exchange that is fragmented and non-linear? What is required of my pedagogy to hold different (or similar) conceptions of transactionality for different scales of exchange (educator-child, cellular)?

EPOC also adopts a transactionality that confronts temporality, as it locates caloric deficits in the future (vigorous physical activity *now* leads to an increase in calorie-burning capacity *later*). I can use post-developmental pedagogies to confront this temporal imperative, and attend to the multitude of temporalities that reconfigure pedagogical practice (Farquhar, 2016; Myers, 2016; Pacini-Ketchabaw & Kummen, 2016). With post-developmental practices that cultivate an attention to the present and detail the dangers of imposing future-oriented logic upon early childhood education (Holmes & Jones, 2016; Olsson, 2012; Blaise, Hamm, & Iorio, 2016), I can generate problems of transactional logic: when pedagogies locate children's aerobic activity as a transaction that enables future calorie burning, what kinds of movement, bodies, and learning do these pedagogies enable? How do pedagogies that are underpinned by the metabolic consumption of calories-to-come mesh with my pedagogical values? How does pedagogy do exchange(s) in early childhood education?

The 'how' of making EPOC a generative problem with pedagogy is always partial and I have offered here two potential means of EPOC-problem-ing with post-developmental pedagogies. There are, I hope, a multitude of additional problems that EPOC poses with pedagogies, some of which might include problems of homeostasis (what does the assumption of equilibrium do with pedagogies?), agency (who makes/enacts/does EPOC?), veracity (how is EPOC contested from within Physiology?), or difference (how does EPOC do difference?). Having articulated how I might take physiological knowledges as a problem *with* pedagogy, I

take up my second proposition, that of generating pedagogical provocations capable of holding physiological knowledges accountable beyond the answerabilities Physiology typically encounters.

Generating Pedagogical Provocations to take Physiological Knowledges to Account

After working two EPOC – excess post-exercise oxygen consumption – physiological knowledges into problems with post-developmental pedagogies, I turn toward generating pedagogical provocations wherein pedagogies might hold physiological knowledges to account. With this second proposition, I focus on deploying the problems that I have crafted with pedagogies, while foregrounding that these provocations double back to generate novel problems. Post-developmental pedagogies detail how pedagogies continually (re)craft meaning and meaning-making practices (Nxumalo, 2017; Rautio, 2017) because of the answerabilities and accountabilities that participants in a pedagogical entanglement demand from one another. This parallels Haraway (1988, 2016) and Willey’s (2016) concern with the ethical accountabilities of Scientific knowledge production and echoes Stengers’ (2005) contention that “the ‘how’ is a question which exposes, which puts at risk, those who are obliged.... [and] only these people can take the risk of putting experimental change into the formulation of their obligations, because only they are exposed by the question” (p. 192). In the context of the pedagogical work I am proposing, these feminist science studies insights mean that generating pedagogical provocations is a question of answerability because different bodies are differently accountable to different problems, provocations, and pedagogies. Post-developmental pedagogies act on these accountabilities by creating pedagogical spaces, questions, and conditions that demand that those involved in the unfolding of a pedagogy confront the tensions and imperfections that tug at the borders of that pedagogy (Early Childhood Pedagogies

Collaboratory, n.d.). This is *how* I understand a pedagogical provocation to function.

Provocations intentionally, but not haphazardly, put ideas, knowledges, people, and practices at risk because of how these actants entangle with the pedagogies that underpin or animate the provocation. I need to craft provocations that draw physiological knowledges into differently answerable initial, partial pedagogical entanglements; into precise problems that demand physiological knowledges become accountable to pedagogies because pedagogies ask different questions of physiological knowledges than Scientific accounts do.

Pedagogical provocations of responsivity. In taking EPOC response physiological knowledges as a problem for pedagogies, I wondered how EPOC might spawn problems of responsivity with pedagogy: *how is the 'response' practiced by EPOC im/perceptible to the responsivenesses of pedagogy?* With post-developmental pedagogies, which make a habit of problematizing discourses that allow for the easy translation of one state/knowledge/practice into another in planned, bounded, and future-oriented ways, I can remind EPOC of the violences inherent in such linearity: when we understand our flesh or pedagogies as predictably responsive, what possibilities for pedagogy are made possible? This is a *provocation of wondering the responsivities that animate pedagogies*, of tracing multiple modes of co-extensive relational response and entanglement. What happens when I intentionally attend to how responding/responses happen in the education spaces I participate in? How do Euro-Western or neoliberal conceptions of response entangle with my pedagogical habits in both obvious and inadvertent ways? Where do Physiological or EPOC notions of dose-response logic interject in my, and children's, movements, engagements with flesh, or other methods of responding – and how might I, or do I, want to confront these methods of responding? This might work to unsettle

EPOC certainties and make visible the tensions in trying to contain possible modes of response that interject in early childhood education practice.

Returning to the *Guidelines*, there is a package of resources designed for educators to share with children (ParticipACTION, 2016b). These include colouring pages, matching games, and a certificate of achievement, which intend to evoke a specific kind of pedagogical response. As a pedagogical provocation that takes up the problems that predictable pedagogical response-logics make with pedagogies, I wonder how these resources might make visible non-linear, non-human-centered methods of responding: how can these resources be engaged pedagogically while intentionally decentering the belief that these resources draw a predictable, universalizable, or controllable response from the children and other participants/materials/agencies that engage with these? How else can we *respond with* colouring pages, complexifying the responses that these resources assume? How might different material analyses, ontologies of ‘health’, epistemologies of education, or constructions of childhood generate different possibilities for responding with these normative resources? Perhaps this provocation might upset the bounded, curated responsivity that these resources enact, and make predictable response-logic visible as only one potential method of responding with/in post-developmental physical activity pedagogies.

Pedagogical provocations of transactionality. Posing EPOC’s transactional logic as a problem with pedagogy, I asked *how EPOC transactions might matter with pedagogical modes of exchange*. Thinking with post-developmental pedagogies, I can take up the im/perceptibility of economic/metabolic transactional logic, tracing where this logic emerges in children’s everyday engagements and where it intrudes into encounters. This is *a provocation of attending to transactions*, of making visible how the specific exchange-mode of EPOC physiological

knowledges might contradict post-developmental pedagogies-informed methods of exchange. EPOC articulates an ethic of exchange grounded in a specific future-oriented temporality. With post-developmental pedagogies, I can ask what might be required to frame flesh as in pursuit of a future utopic ('healthy') state – what must be possible for EPOC and the *Guidelines* to locate physical activity amid a futurities framework? Post-developmental pedagogies oriented toward productivity (Lenz Taguchi, Palmer, & Gustafsson, 2016; Pacini-Ketchabaw et al., 2016) lend resources for asking what the ethical implications of centering a physiological knowledge that creates oxygen deficits to burn future calories might be: this is a *provocation of complexifying how, or if, movement matters as a transaction*. The resources for educators (ParticipACTION, 2016b) detail 60 'sweat' activities that educators can use to promote sweaty vigorous physical activity, including 'chase a fairy', 'run from zombies', 'shoot hoops', 'sword fight a pirate', 'chase the boys', 'escape prison', and 'chase the girls'. From pedagogies that take movement as unpredictably generative (Jackson, 2016; Manning, 2012, 2014; Rotas, 2015; Rotas & Springgay, 2013), I know that movement does far more than displace a body in space or fulfill recommendations for physical activity. I wonder how these suggested 'sweat' activities might be engaged for the 'transactions' they invite? What if I intentionally do not conceptualize these movement activities within a vigorous physical activity/EPOC frame of transaction, and instead follow how these activities generate exchange(s) that do or do not mesh with my pedagogical intentions? Perhaps this provocation might hold to account the idea of moving as propagating oxygen absences or promoting normative health, while opening space to trace how debts, surpluses, exchanges, and transactionalities are made, multiply and momentarily, with post-developmental pedagogies.

Towards a *Why* for Taking Physiological Knowledges to Account with Pedagogies

In mainstream early childhood education in Canada, Physiology often matters as physical activity guidelines, nutrition recommendations, and normative developmental dictates. This is not to say that Physiology is a special site of engagement or governance or resistance in early childhood education, only that it is an onto-epistemological force that demands to be reckoned with. I have argued that post-developmental pedagogies can work physiological knowledges toward a complex pedagogical answerability and I have explored one possible strategy for how pedagogies can confront the physiological knowledges that matter to early childhood education. I have made clear that, for my work, this involves a specific practice of recognizing how Physiology is complicit in Euro-Western epistemic hierarchies, while taking physiological knowledges as problems with pedagogies, while putting these problems to work to generate pedagogical provocations that can hold physiological knowledges accountable. My practice of crafting problems with pedagogies while deploying pedagogical provocations aimed at demanding a different answerability of physiological knowledges is always partial, necessarily contestable, and vulnerable to both unsettling and re-centering the dominant forms of knowledge I work to complexify.

Echoing Stengers (2005), I believe that we need pedagogical innovations that take up physiological knowledge(s) “it as it diverges, that is, feeling its borders, experimenting with the questions which practitioners may accept as relevant, even if they are not their own questions” (p. 184). Taking physiological knowledges to account with post-developmental pedagogies exposes Physiology to the critical terrain of post-developmental early childhood education, thus working physiological knowledges to account with pedagogical concerns, innovations, and answerabilities that differ from the benchmarks that Sciences are typically held to. Within much

larger, incredibly diverse projects of dismantling the dominance of colonial epistemologies, perhaps weaving physiological knowledges with post-developmental pedagogies might function, as an imperfect and situated intervention, toward unsettling dominant hierarchies of Scientific knowledge while confronting some governing practices of making flesh perceptible in early childhood education.

Preface to Article 3

I return to pedagogical inquiry work with children and educators in this article, as I trace how muscle(s) – diaphragm muscle(s) – came to matter throughout our work. Using the practice that I outlined in Article 2, of making physiological knowledges a problem with post-developmental pedagogies while generating pedagogical provocations to hold physiological knowledges to account, I argue for a pedagogical shift from describing what muscles are or how muscles should be used toward a consideration of ‘muscling’ as an ongoing process. I position this as practice in understanding muscle(s) as an active pedagogical concern, wherein thinking with muscling as consequential and ongoing entails different accountabilities than those made possible when we think of ‘muscle’ as something materially stable, located in children’s bodies, or as a strictly Physiological entity. Muscling, I argue, raises questions of how muscle(s) are made visible, how muscle(s) might be participatory, and how muscle(s) happen in process in early childhood education. As I foreground situated diaphragm muscling(s) from inquiry work, I contend that thinking muscle(s) as an active, constant pedagogical participant and activity implicates my pedagogical intentions in how muscle(s) become perceptible.

The muscling that I articulate in this article is, I believe, an important contribution that my dissertation might make in and beyond early childhood education. I hope that disrupting mainstream habits of thinking ‘pedagogies of muscle’ toward wondering with ‘muscling pedagogies’ could potentially shift discussions of/with muscle(s) in education to considerations of how, and what, muscling can do with pedagogies across a variety of educational milieus. As such, this article is intended for an early childhood education audience through a critical pedagogies journal. I will also develop these ideas for a physical education audience in the future and I hope to return to ‘muscling’ in my post-PhD research. I am especially interested in thinking

muscling with some of the more ‘obvious’ (and highly-coded) muscles that children might encounter in neoliberal spaces: biceps, gluteal, and abdominal muscles.

This article is entirely situated in cold and flu season. During our second movement pedagogical inquiry, it was a chilly January and there were plenty of sniffles, sneezes, and coughs working their way through the child care centre. I do not shy away from the contingency of the moments that cold and flu season made possible in thinking with diaphragm muscle(s). I position sneezy season as essential to noticing coughs, which made possible our engagements with breathing, which reminded us of how diaphragm muscle(s) participate in breath, which encouraged us to bring certain provocations into the room, which then cascaded into our different experiments with moving. I think with diaphragm muscle(s) because they mattered in important ways because it was cold and flu season. Holding to this specificity allows for a consideration of muscle(s) as a situated, precise ‘doing’, rather than as a universalized material entity. I attend to diaphragm muscle(s) in this article not to exceptionalize these specific muscle(s), but to notice carefully how these muscle(s) matter in dominant and less-familiar practices in early childhood education. I work to make clear that I do not present a ‘new’ way to theorize all diaphragm(s) because they are especially important muscle(s). Rather, I trace how muscle(s) that mattered to our inquiry, and that are implicated in various physiological knowledges, might be engaged beyond predominant Physiological methods of understanding muscle. This practice, I argue, can infuse muscling and doing diaphragm(s) with an answerability that predominant Euro-Western methods for understanding muscle(s) do not permit.

Article 3.

Muscling Pedagogies (with Diaphragms, Cold Season, Physiological Knowledges, and Fans)

Abstract

This article debates how muscles happen in early childhood education. Drawing on post-developmental pedagogies and feminist science studies, this article integrates documentation from a pedagogical inquiry with movement in early childhood education to trace how muscles matter as complex and active ethical, political, and pedagogical concerns. After elaborating how muscles are understood in dominant Canadian pedagogical resources, the diaphragm muscle is mobilized to explore how physiological understandings of muscles might pose problems of consequence, ongoingness, and access and activation with pedagogies. I then work these problems into pedagogical provocations of perceptibility, process, and participation that endeavor to take physiological knowledges to account. I conclude by discussing how a focus on ‘muscling’ illuminates how pedagogical intentions can make muscles differently perceptible, while drawing muscles into pedagogical entanglements that are foreclosed by predominant Euro-Western methods for understanding how muscle and pedagogy are related.

Keywords: post-developmental pedagogies, muscles, early childhood education,
feminist science studies

Muscles often participate in early childhood education pedagogical practices via familiar recommendations: allow for at least 180 minutes of physical activity per day (Canadian Society for Exercise Physiology, n.d.); teach fundamental movement skills at a young age to promote a lifetime of healthy movement (Temple & Preece, 2007); ensure children eat a healthy diet to promote optimal muscle and bone development (Chronic Disease Prevention Alliance of Canada, n.d.). These pedagogical standards integrate Euro-Western Science-based Physiological¹ conceptions of bodies and health to understand muscles in specific, neoliberal state-sanctioned ways (Article 2, in this dissertation). While these recommendations define how muscles should be predictably and quantifiably understood in childhood and education, they do not engage questions of how muscles *happen* in early childhood education. Further, habitual invocations of muscle make specific entanglements of muscles and pedagogies possible, but do not cleave space for wondering how muscles might become differently pedagogical. What if, rather than assuming existing pedagogies adequately comprehend muscles, we wonder how muscles happen in early childhood education? If we refuse to engage muscles only on familiar terms, what possibilities for thinking muscles with pedagogies might we generate? How might muscles matter as complex, active, and entangled ethical, political, and pedagogical concerns?

This article takes up these questions, wondering how muscles matter as ongoing, tentative, and never pre-determined practices of *doing* muscle(ing) *with* pedagogies in early childhood education. I begin by exploring how early childhood education physical activity resources in Canada understand and utilize specific Physiological Science constructions of

¹ Physiology studies the biological (specifically biochemical and anatomical) function of organisms. I utilize ‘Science’ and ‘Physiology’ to designate the hegemonic, canonical status ascribed to Scientific methods as knowledge production apparatuses of Euro-Western settler colonial epistemic hierarchies (Subramaniam, 2014; Sanabria, 2016; Willey, 2016).

muscle. I then trace how these specific understandings of muscle(s) delimit the possibilities for how muscles(s)² and physiological knowledges³ can be deployed pedagogically. Thinking with moments from a pedagogical inquiry with children and educators, which focused on movement during cold and flu season, I then turn to the diaphragm muscle to explore how muscle(s) might happen otherwise – as active, ongoing, situated, ethical concerns – with physiological knowledges and pedagogies. Employing a practice of generating pedagogical problems with physiological knowledges and crafting pedagogical provocations that can take physiological knowledges to account, I pick into three diaphragm physiological knowledges to draw these contested colonial Science-rooted knowledges into demanding critical conversation with post-developmental pedagogies. I investigate how diaphragm physiological knowledges might pose problems of consequence, ongoingness, and access and activation with pedagogies, and then work these problems into pedagogical provocations of perceptibility, process, and participation that endeavor to take physiological knowledges to account. I conclude by articulating muscling pedagogies as an impetus for wondering how muscle(s) might matter with post-developmental pedagogies. Importantly, the various ways that I do muscle in this article are built of the precise

² ‘Muscle’, ‘muscles’, and ‘muscle(s)’ are used from this point forward in this article to refer to different knots of Physiology, physiological knowledges, pedagogical intentionality, and flesh. Muscle refers to the singular, bounded, stable flesh maintained by Physiology. Muscles are the plural of this (a bicep, bicep muscles). Muscle(s) are the uncertain, lively, momentary muscling(s) that become consequential when muscle is no longer assumed to be generalizable, strictly dictated by Physiology, or an always intact bodied feature (bicep(s), muscling bicep(s)).

³ I utilize ‘physiological knowledges’ to refer to the contested onto-epistemological footings, imperfect inquiry practices, and unevenly lived consequences of bio-scientific knowledges (Landecker, 2013; Mol, 2002). I borrow from Landecker’s (2013) discussion of “fat knowledge” (p. 498) to think physiological knowledges as a tool for interrogating what Physiological understandings create/make *with* the material flesh they study/describe. Physiological knowledges attend to the epistemic and fleshed consequences of Physiological explanations, and I use these knowledges for the productive questions they can ask *with* pedagogies, not for their Physiological truth or validity.

physiological knowledges, problems, provocations, and inquiry moments that I purposefully knot together while generating each muscling. These examples are situated, non-universalizable, momentary, and animated by the limited and imperfect pedagogical loyalties and accountabilities that I bring to this article. I intend for muscling to function as a lively proposition with post-developmental pedagogies, not as a ‘new’ or ‘best’ way for theorizing muscle(s) in early childhood education.

Muscles and Pedagogies

Within the mainstream material-discursive conditions (Barad, 2007) that inform Euro-Western early childhood education in Canada, muscles are made to matter in pedagogy when tied directly to notions of normative and developmentally-appropriate movement, including formulations of physical literacy, fundamental movement skills, or physical fitness (Land & Danis, 2016). Physical literacy discourses tend to make muscles perceptible as the biomechanical outcomes of their Physiological function. For instance, biceps might be of concern to early childhood education pedagogies because biceps are essential to the act of throwing, which is a fundamental movement skill that serves as a building block for more complex movement patterns that a child must learn in order to confidently participate in productive, sanctioned physical activity. Physical activity discourses, such as the *Canadian Physical Activity Guidelines for the Early Years* (Canadian Society for Exercise Physiology, n.d.) or *Healthy Beginnings for Preschoolers 2-5* (Chronic Disease Prevention Alliance of Canada, n.d.), make muscles knowable as tools of metabolic energy consumption, where conceptions of ‘energetic play’ abstract muscles to a language of exercise intensity, type, and duration. With physical activity discourses, muscle is knowable as a background feature of motion such that muscles are essential to movement taking place but not of overt pedagogical concern. These pedagogies of physical

activity only allow for an attention to if (or how) muscles are being ‘used’ to properly perform permitted movement.

Muscle is made to walk a precarious line of perceptibility in mainstream early childhood education discourses, where muscle matters because children’s bodies contain muscles and these muscles must be utilized as children are taught to move in healthy ways. Any complex ethico-onto-epistemic (Barad, 2007) materialities of muscle(s) (and the ways that muscles are made differently and familiarly perceptible) are strategically bracketed to force muscle to become knowable as instrumental, Scientific, and subject to normative health and fitness discourses (Article 2, in this dissertation). This move to obscure muscled potentialities is made real in the tendency of physical literacy and physical activity resources for educators to speak of muscles as agility, balance, or coordination skills (Canadian Sport for Life Society, 2016) that enable children to receive numerous health benefits (ParticipACTION, 2016) and be physically competent and confident throughout their lifespan (Physical Health and Education Canada, 2017). A more overt attention to muscled flesh is relegated to peer-reviewed Scientific background publications (for example: Canadian Society for Exercise Physiology, 2016b; Timmons, Naylor, & Pfeiffer, 2007; Tremblay, Shephard, & Brawley, 2007).

Physical literacy and physical activity constructions of muscle rely on Physiological understandings of muscle, where muscles are understood as movement-generating threads of myofibrils that contract and relax, with incredibly complex biochemical systemicity, in service of generating force or motion (McArdle, Katch, & Katch, 2006). Concurrently, physical activity practices are implicated in settler colonial epistemic constructions of fleshed normality, bodied legitimacy, and Euro-Western hegemonic health imperatives (LeBesco, 2011; Rice, 2007; Rich, 2011), which are sustained by and sustain mainstream Scientific framings of health-based

Physiological data (Harding, 2006; Haraway, 2013; Landecker, 2013; Sanabria, 2016). Taken together, this reliance on colonial Physiological Science and the continual re-assertion of Physiological Truths About Health iteratively sustain the epistemic need for normative Physiology. Physiology, as a dominant epistemic system that is entangled with early childhood education, is well-served by discourses that abstract muscles to quantifiable motion and bury the pedagogical potentiality of thinking with physiological knowledges amid pedagogical imperatives to prevent obesity and ensure active, healthy learning.

While the precise mechanism of the obscuring of muscle(s) in early childhood education pedagogical resources is beyond the scope of this article, I root my engagement with muscling pedagogies at this juncture. While muscle is typically made perceptible in very limited, state-sanctioned patterns (Rice, 2016), I argue that muscle(s) can matter in a multitude of ways with pedagogies. Rather than critiquing how Physiological habits of muscle function as techniques of fleshed governance, I aim to generate, as Willey (2016) calls for, a partial “vision of what it might look like to politicize scientific knowledge production in a way that allows for an answerability, an accountability, beyond the realm of internal critique, that science as we know it lacks” (p. 14). I bring muscle(s), post-developmental pedagogies, and physiological knowledges into conversation with feminist science studies, and make visible the tensions and possibilities in submerging predominant Euro-Western knowledges (Physiology) in different Euro-Western theoretical resources (post-developmental pedagogies). Taking physiological knowledges to task with pedagogies, I argue, might begin to unsettle the epistemological hegemony of Euro-Western scientific conceptions of muscle, while cleaving space to think muscle(s) otherwise with early childhood education pedagogies.

Diaphragm Muscle(s) with/in Pedagogical Inquiry

This article draws upon a pedagogical inquiry centered on movement in early childhood education at a child care center in British Columbia, Canada. As part of an ongoing multi-year collaborative research program, educators, children, families, and pedagogical facilitators think collectively about how we might create pedagogies relevant to the tensions, challenges, privileges and politics of living in contemporary Canada. We participate in ‘inquiry work’, which brings pedagogical documentation (Hodgins, 2012; Pacini-Ketchabaw, Nxumalo, & Kocher, Elliot, & Sanchez, 2015) together with our intentions for thinking pedagogy differently from the settler colonial, humanistic, child-centered, and normative developmental tendencies of mainstream Euro-Western education (Taylor & Pacini-Ketchabaw, 2015). We craft ‘provocations’ intended to unsettle our habitual engagements with everyday events, and educators and pedagogical facilitators inquire with children as we gather documentation and generate questions to complexify our thinking. We understand pedagogy and inquiry to be deeply connected, as the problems, troubles, curiosities, and joy we generate with inquiry work emerge with/in everyday moments of practice, and continually re-inform our possibilities for thinking pedagogically (Early Childhood Pedagogies Collaboratory, n.d.).

I participate in this project as a pedagogical facilitator and researcher. Echoing Nxumalo’s (2014) discussion of acting as a facilitator and researcher, I continually negotiate my embeddedness as an active co-participant in inquiry and work to be accountable, to all participants in inquiry work, for how our moments of inquiry are engaged in my writing. In this article, I use the language of ‘*our*’ inquiry to refer to the collective ethic that children, families, educators, and pedagogical facilitators practice. While I speak of inquiry work from my perspective, I often use ‘*we*’ to make clear how my experience is profoundly entangled with the

tensions, response-abilities, and accountabilities of thinking pedagogically that we negotiate together.

Our pedagogical inquiry with movement, which I draw upon in this article, began from an intention to think moving critically and expansively, as we responded to the highly-regulated ways that movement happens in typical childhood spaces. As we began our inquiry one January, we were deep in cold and flu season and the sneezes, coughs, and wheezes that accompany respiratory germs began to mingle with how movement unfolded. Embedded in breath, with air, and through coughs, diaphragm muscles, which is the muscle that Physiology delineates as the primary muscle of human breathing, emerged as consequential participants in our movement inquiry. Diaphragms have undoubtedly mattered to our ongoing inquiry work in a multitude of ways: as slow, steady breath gathered before carefully slicing fabric with scissors, in chilly voices animated by heavily-humid forest air, and with upside down diaphragms in bodies balanced against window frames. Following the coughing and sneezing interjections of diaphragms, we began to attend to specific, emergent diaphragm muscles(ing). As we traced how flu season translated into a smaller number of children present in our movement inquiry and where sleepy slowness drew children and educator bodies to the floor, we tuned to breathing and diaphragms as movement. As exhalations of breath toppled coils of paper and deep breaths aimed toward tiny torn paper fragments were interrupted by sneezes, we found ourselves speaking of breath and of air while moving with/in diaphragm(s).

Diaphragms mattered to our inquiry with moving, and, therefore this article follows diaphragms while thinking muscle(s) with pedagogies. I do not intend to position the diaphragm as an especially pedagogical or central muscle. Rather, in wondering how muscle(s) might happen differently with pedagogies in early childhood education, diaphragm muscle(s) serve as

one situated, specific, and momentary entry point. That other muscle(s), organs, or fleshed features might generate different responses to our inquiry provocations is of utmost consequence: any muscle(ing) is a necessarily local, precise, and continually rearticulated pathway into debating how bodies matter in early childhood education. I turn now to detailing how I think muscle(s) with physiological knowledges with post-developmental early childhood education pedagogies.

Thinking Physiological Knowledges with Post-Developmental Pedagogies

Post-developmental early childhood education confronts dominant Euro-Western narratives of child development by making visible how specific understandings of education, childhood, and development are made possible when varied practices, epistemologies, and ontologies are privileged (Iorio, Hamm, Parnell, & Quintero, 2017; Nxumalo, 2017a; Pacini-Ketchabaw, Kind, & Kocher, 2016; Rautio, 2013). Early childhood education reconceptualist scholars, who provide a grounding for post-developmental theorizing, argue that when Euro-Western developmental theories position normative stage-based development as a universalized frame, alternative understandings of childhood and learning are silenced (Burman, 2016; Cannella, 1997; Dahlberg, Moss, & Pence, 2013; Kessler & Swadener, 1992; MacNaughton, 2000). The normalizing intentions of developmental theories are, these scholars argue, firmly rooted in promoting neoliberal principles amid Euro-Western systems of governance: citizenship, individualized responsibility, economic productivity, and colonial patriarchal and race-based power relations (Burman, 2001; Canella & Viruru, 2004; Dahlberg & Moss, 2005; Moss, 2016). Particular pedagogies are thus required in order to ensure that education best facilitates children's achievement of the benchmarks set by developmental constructions of childhood (Blaise, 2005; Pacini-Ketchabaw, Nxumalo, & Rowan, 2014; Pacini-Ketchabaw &

Taylor, 2015). Such pedagogies invest in modernist approaches to learning as the direct transfer of information from adults to children (Kessler & Swadener, 1992; MacNaughton, 2003; Olsson, 2012; Pacini-Ketchabaw, 2010).

Post-developmental pedagogies, as a response to developmental narratives, understand childhood and education as situated, plural, and lively happenings, which demand pedagogies that are responsive, ongoing, and locally-meaningful (Blaise, 2013, 2014; Holmes, 2016; Lenz Taguchi, 2011; Rautio & Jokinen, 2015). In an effort to impede how predominant pedagogies reflect inherited Euro-Western educational dictates onto children's learning, the post-developmental pedagogies that I think with in this article prioritize alternative pedagogical intentions concerned with how children might respond to the complex worlds they inherit and grapple with in everyday life (Blaise, Hamm, & Iorio, 2016; Rautio, 2017; Taylor & Pacini-Ketchabaw, 2015). Most important to this article, post-developmental pedagogies *do* pedagogy as an intentional, demanding process (Nxumalo, 2017b; Pacini-Ketchabaw et al., 2016; Taylor, 2017); pedagogy as a contextual, co-constructed, constantly negotiated undertaking that unfolds with more-than-human others, materialities, and a multitude of political entanglements.

In this article, I put forward a post-developmental pedagogies practice of (1) making physiological knowledges a problem *with* pedagogies while (2) developing pedagogical provocations intended to hold physiological knowledges to account with pedagogies. To build the first proposition, that of crafting pedagogical problems with physiological knowledges, I take inspiration from post-developmental pedagogies scholars who situate pedagogy as an intentional labour that is nourished by the specific ethical and political intentions that researchers, educators, and children contribute to pedagogical work (Pacini-Ketchabaw et al., 2016). I read this emphasis on activeness and intentionality alongside Stengers (2008), a feminist science studies

scholar, who contends that “connections are something that must be created...this is the only way of succeeding in creating problems rather than receiving them readymade” (p. 9). Rather than assuming physiological knowledges can pose problems *for* pedagogies, or that post-developmental pedagogies might already contradict physiological knowledges, I work to knit physiological knowledges *with* pedagogies to create generative problems – problems that cause the pedagogical intentions that I foreground to question their limitations and that center the rich, power-laden, consequential tensions in thinking physiological knowledges with pedagogies.

To craft pedagogical provocations capable of holding physiological knowledges to account, the second proposition that this article takes up, I move the pedagogical problems that I have generated with physiological knowledges toward provocations that I can deploy with moments from our pedagogical inquiry work with movement. Borrowing from scholars who elaborate how post-developmental pedagogies continually knot and re-knot lively knowledges, bodies, and place(s) together differently (Early Childhood Pedagogies Collaboratory, n.d.; Hodgins, 2014; Nxumalo, 2017b), I understand that the pedagogical problems and provocations I generate are precise, intentional, and demand accountability. To detail what my accountabilities might entail, I turn to Willey (2016), a feminist science studies scholar, who emphasizes that “when we claim sciences, instead of ‘engaging’ them, the terrain shifts from one of how un/friendly feminists are to Science to one of what a world of sciences has to offer, where so much is at stake” (p. 146). Willey argues that those who are complicit, trained in, or benefit from Scientific structures need to ‘claim’ – to stick with and generate interventions in – these knowledge systems. Reading Willey’s contention alongside post-developmental pedagogies, the problems and provocations I generate are rooted in my intention, as a white settler in Canada, to interrupt Physiology because of my privileged complicity in Scientific and Euro-Western

colonial knowledge structures. I figure my accountability as a situated, bounded, imperfect practice of weaving physiological knowledges and pedagogies into momentary relationships that force physiological knowledges to answer to different problems, provocations, and pedagogies than Physiology might typically encounter in mainstream Euro-Western early childhood education (Lenz Taguchi, 2016).

My critical confrontations with Physiology are informed by the Euro-Western knowledges (post-developmental pedagogies, feminist science studies) I choose to foreground and I appreciate that my project is fraught with the necessary limitations of a settler engagement with settler systems. There are many non-Euro-Western scholars who elaborate differently lived sciences, such as Indigenous scholars TallBear (2013), Todd (2014), and Kimmerer (2013), and I respectfully separate my intervention into dominant Sciences from the work these scholars do in refusing to yield Indigenous sciences to colonial structures. I cannot, and do not hope to, outline an exhaustive, comprehensive array of possible problems, provocations, or pedagogies. The problems and provocations that I mobilize in this article – and the questions, materials, and tensions that children, educators, and research grapple with in our pedagogical inquiry work – often perpetuate some of the power relations that we are trying to disrupt: my settler body is still present on colonized land, I still think with post-developmental theories that use Euro-Western knowledges, and I still produce research dissemination materials typed into English words. Amid a multitude of critical, creative, and non-Euro-Western engagements with flesh, muscle(s), and physiological knowledges, I offer my pedagogical intentions, the pedagogical problems I generate with physiological knowledges, and situated pedagogical provocations as one bounded act in an enormous project of unsettling the epistemological clout of Euro-Western Science.

Doing Diaphragm Muscles(ing) with Post-Developmental Pedagogies

Physiology might introduce the diaphragm as the fundamental muscle of human breathing (Martini, Timmons, & Tallitsch, 2009). Buried within an abdomen, Physiology knows the diaphragm as a dome-shaped sheet of muscle that attaches to a sternum (the flat bone at the center of a chest), holds to the ribs, wraps around to grab the vertebrae of the spine, and culminates in a tendinous sheet at the center of the ‘bowl’ of the muscle. Physiology instructors taught me to analogize the diaphragm as a muscled umbrella within the base of my chest, moored along its rim to my ribs and spine, so that it spans the entirety of the cavity of my abdomen. This umbrella is secured with a central tip that clings to its organ neighbours, including connective tissues around my heart and lungs, to hold it in place and to keep the umbrella tines open. When I breathe in with this diaphragm physiological knowledge, my diaphragm-umbrella stretches flat and my ribcage lifts outwards (in concert with other muscles in my chest and belly), increasing the space in my thoracic cavity and creating an environment that invites air to fill my lungs (Moore, Dalley, & Agur, 2010). When I exhale, my diaphragm re-assumes its domed umbrella shape as it swells into the space of my chest and my ribs strike inward, shrinking the space for air in my chest and pressuring the breath in my lungs to exit.

Interjecting (Outcome-Driven) Diaphragms

Physiological knowledge: Outcome-driven diaphragms. Diaphragm physiological knowledges often know breath as a product, as an outcome. For these outcome-driven diaphragm physiological knowledges, breath is the beginning and end product of respiration. Outcome-driven physiological knowledges do not argue breath as a ‘finished’ product, but do know that breath is the consequence of diaphragmatic work. The effort of brain centres that generate electrical signals, the phrenic nerve that transmits nervous system stimuli to the diaphragm, and the

expanding and contracting muscle proteins of the diaphragm are made meaningful through their production of breath because breath is essential to human life (Martini, Timmons, & Tallitsch, 2008). Outcome-driven physiological knowledges enact a diaphragm that can be known most in air, not with muscle; as a muscle that has meaning because it does breathing (where breathing is something that humans can readily notice, especially in its absence).

Pedagogical problem: How are muscle(s) consequential? Taking outcome-driven diaphragm physiological knowledges as a problem with pedagogies generates a problem of how pedagogical practices might converse with, or complexify, an outcome-oriented logic that makes diaphragm(s) perceptible and meaningful because of breath: *how are diaphragm muscles made consequential with pedagogies?*

In Canada, the *24 Hour Movement Guidelines for Children and Youth* (Canadian Society for Exercise Physiology, 2016b) adopt outcome-driven diaphragm physiological knowledges to understand diaphragm contractions as breath, and (the loss of) breath is transformed into a proxy measure for achieving the recommended moderate-to-vigorous physical activity intensity. These pedagogies designate breathlessness as an arbiter of aerobic exercise, where educators are reminded to ask children if they can move and speak at the same time to assess their exertion level, thus making diaphragms consequential as an indicator of successfully implemented fitness programming. Yoga or mindfulness-informed early years pedagogical resources invoke breath as a site of calmness or a mode for children to attend to the rhythms of their own flesh. These pedagogies make diaphragms consequential as a symbol of human-centered, adult-directed attention that can only be cultivated through a specific set of instructional practices.

Pedagogical provocation: Making muscle(s) perceptible. If outcome-oriented diaphragm physiological knowledges pose a problem of how muscles become consequential with

pedagogies, post-developmental pedagogies can put to work the discomfort in abstracting muscular work to breath. With post-developmental pedagogies, I might debate what happens to/with muscle(s) when an educator can/should ask a child how hard they are breathing in order to assess if they are exercising appropriately – how many conversions do our pedagogies require muscle(s) to undergo before muscle(s) become of pedagogical import? What is required to make diaphragm muscle(s) consequential with/in varied pedagogies? Generating pedagogical provocations that hold physiological knowledges accountable, outcome-oriented diaphragm physiological knowledges mark a *provocation of the ethical and political activity of making muscle(s) perceptible*. This is an impulse to probe not just what, but how, diaphragm muscle(s) are made visible with pedagogies, and necessitates an attention to the political labour of making muscle(s) perceptible.

Critical childhood studies and early childhood education reconceptualist scholars often critique neoliberal governmental techniques for subsuming problematic or inconvenient materialities within human-mediated discursive categories in order to carefully control the conditions of engagement with these matters. For example, Rich (2011) discusses ‘being obese’ as the intricate, insidious abstraction of fleshed fat into obesity as a technique of Euro-Western governance. Extending this critique, post-developmental pedagogies can probe what might be entailed in the non-accidental conflation of muscular work to breath in outcome-driven diaphragm physiological knowledges: when diaphragmatic work is rendered as breath, which is translated as life-sustaining, how might dictates of anthropocentric human flourishing tied to normative health, fitness, or bodied legitimacy gain traction? When physiological knowledges hold that human diaphragms make breath as a product, what alternative ontologies of breath, of air, of muscle(s) are erased and enabled? With pedagogies that disrupt institutionalized Euro-

Western modes of noticing and frames of knowledge generation (Blaise, Hamm, & Iorio, 2016; Lenz Taguchi, 2011; Pacini-Ketchabaw & Kummen, 2016; Rautio, 2017), I can contest outcome-driven diaphragm physiological knowledges by picking into the reductive gesture of representing muscled work as quantifiable inhalation and exhalation: what narratives of Euro-Western human-centric sensory exceptionalism are perpetuated when muscle(s) that our fingers cannot touch are made most perceptible as breath we can feel on our skin?

Muscling: Making muscle(s) perceptible in our inquiry. Taking this provocation of how diaphragms are made perceptible with pedagogies into our inquiry, we found accessibility in first noticing how breath did moving. As I watched an educator and a child shuttle a cone of paper across the floor to one another using the momentums of breath, I wondered if tracing the rising of shoulders, the pointing with chins, the precarious pauses of stalled paper, or the multiple exhalations required to move with paper across the room is a mode of attending to muscle(s), or to breath? What happens when I participate, as I did, by narrating this moment with ‘I see your belly muscles pushing into the floor to breathe’ as opposed to ‘look at how far that paper moves’? I suspect that this does not do enough to disrupt the bounded-humanist frame of Physiology that I want to contest, the same structure that allows for muscle to be (outcome) breath to be (sanctioned) exercise to be (normative) health. To make diaphragm muscle(s) pedagogically perceptible as more than an outcome, I take seriously Haraway’s (2016) charge of truly making outcome-oriented diaphragm physiological knowledges “unthinkable: not available to think with” (p. 57). I do not want to only make breath differently perceptible in practice, but I do want to attend with muscled breathing; to make thinkable the contingencies, the imperfections, the trouble in doing diaphragm work.

As a roll of paper bounced between diaphragms across the floor, the messy but foreseeable path that it might take from one human breathing-body to another was often disrupted by coughs. Attending to how taxing it might be on already irritated lungs and exhausted diaphragm(s) to propel paper makes diaphragm(s) temporarily perceptible as a matter of endurance, of persistence. Coughs often rapidly roused bodies from their prone positionality on the floor to a kneeling or unstable perch upon one elbow as ribcages, hands, and lungs needed different space to move in the complex performance of coughing: diaphragm muscle(s) made momentarily perceptible in their disrupting. As we carefully set up precarious towers of paper to be pushed over by breath, chest muscle(s) and cold viruses interjected, shattering our human-formed pedagogical breath experiments with sneezes while crafting diaphragm muscle(s) made perceptible as responsiveness and unpredictability. Outcome-oriented diaphragm physiological knowledges are made unfamiliar to our complex diaphragm(ing) entanglements of flu season. To ask if a child is ‘out of breath’ becomes literally incomprehensible and suggesting that a child might require specific instructions to be mindful of the breath their diaphragm makes seems to intentionally minimize the complexity of attending to muscled diaphragms. Knowing diaphragm muscle(s) as simply the breath they produce or the moments when they become empirically measureable feels inadequate in this moment, as different diaphragm(s) are made perceptible through tuning differently to diaphragmatic activity.

Breath and diaphragm(s) become meaningful in their entanglement, where neither breath nor muscle(s) are easily dissected and possibilities for muscled breathing become of pedagogical import. Taking inspiration from the moving (in) pedagogy theorizing of Rotas and Springgay (2013) and Truman and Springgay (2015) who detail movement as an intentional, continually fluctuating immersion in dispersed political ecologies, the work of making diaphragm(s)

perceptible is purposeful but uncertain. While I cannot not control exactly how muscle(s) become perceptible with the pedagogies I participate in, I am answerable to the muscle(s) that I do make possible. Tracing how diaphragm(s) intervene *with* pedagogy (not ‘in’ pedagogy) requires an attention to the ethical activity of making diaphragm(s) perceptible. This involves asking *how* I am making diaphragm(s) perceptible *with* my pedagogical decisions – and why: how am I making muscle(s) perceptible right now? This assertion that people and pedagogies *do* muscle(s) entails thinking muscle(s) as *muscling*, because it positions muscle(s) as an activity. Rather than asking what muscle I am using, I need to ask how *I am doing muscling*. Muscling is not a question of creating ‘new’ ways to understand diaphragms with pedagogy, but of tracing how pedagogies both momentarily allow for, and discourage, less-neoliberal diaphragmatic pedagogical engagements. With diaphragm(s), muscling does not argue that making diaphragm(s) perceptible as breath is inherently problematic, but muscling does make clear that I am accountable to how my pedagogical intentions make different diaphragm(s) possible in different moments and to the lived, pedagogical consequences of purposefully making specific diaphragm(s) perceptible. Muscling then, is a practice of actively (and provisionally) thinking diaphragm interjections pedagogically, while taking physiological knowledges to account, while working to expand possibilities for how muscle(s) can be made perceptible with pedagogies.

Yielding (Ongoing) Diaphragms

Physiological knowledge: Inhalation-exhalation diaphragms. Established Euro-Western principles of passive, externally-regulated pressure gradient gas laws animate diaphragm physiological knowledges rooted in the processes of inhalation and exhalation. These physiological knowledges conceptualize the diaphragm as a mechanism that increases or decreases the space in the pleural (or, chest) cavity, which matters because this space and the

lungs that live within it are subject to Scientific pressure-volume principles of gas behaviour (Unglaub Silverthorn, 2007). With this physiological knowledge, gases, including the air we breathe, exert pressure and prefer to move from areas of higher pressure to spaces of lower pressure. As more gasses cram into a smaller space, the pressure increases and gases desire more strongly to escape the area containing them. When the diaphragm contracts and flattens, thoracic volume increases, the pressure in the chest decreases, and a body becomes hospitable to the oxygenated air that is active in a higher-pressure world outside skin. When the diaphragm relaxes and umbrellas back up into the chest, the space in the thorax is decreased, the air pressure increases, and air rushes out of the lungs into the now lower-pressure space outside of the body. This physiological knowledge draws upon a logic that depends upon the continual (and predictable) fluctuation of gas pressures in molecular worlds.

Pedagogical problem: How are muscle(s) ongoing? Inhalation-exhalation physiological knowledges rely on the diaphragm as continually actively contracting in a functional way because of its ability to capitalize on predictably fluctuating external conditions. As a problem with pedagogies, inhalation-exhalation physiological knowledges make visible how pedagogies encounter this specific bracketing of ‘ongoingness’ as a stable, predictable, instrumental outcome of air pressures: *how do pedagogies understand diaphragm muscle(s) as ongoing (or, as stable, predictable, or complete)?*

Early childhood education physical activity resources in Canada unreservedly announce the work of, and the demand for, moving. For example, incorporating concepts of exercise intensity, frequency, and duration to gauge exertion, the *24 Hour Movement Guidelines for Children and Youth* (Canadian Society for Exercise Physiology, 2016b) emphasize the necessity of integrating movement into curriculum, while also highlighting how this should be done with

precision (constructed of evidence-based research), developmental appropriateness (drawn from dominant Euro-Western narratives of childhood agency and skill), and levity (because moving is fun). Movement becomes something an educator must bring to practice and something that pedagogy must be both hospitable to and an instrument for: muscles should work hard, diaphragms should become exhausted, and breath should be lost to illustrate appropriate pedagogical implementation. This articulates muscles that are ongoing in their teleological, instructional, governmental labour.

Pedagogical provocation: Thinking muscle(s) as process. Where inhalation-exhalation diaphragm physiological knowledges pose a problem of ongoingness with pedagogies, post-developmental pedagogies might wonder the politics of emphasizing forceful labour. If a lack of developmentally-appropriate movement is considered an absence of muscled work by dominant physical activity pedagogies, what muscle(ing) must be must be erased, foreclosed, or altered to understand muscle(s) as ongoing only when they produce ‘useful’ motion? What happens when muscle(s) become a tool of pedagogy, where specific pedagogical practices actively sanitize muscle(s) of non-instrumental ongoingness to sustain the necessity of movement promoting instructions? How (non)ongoing do our pedagogies demand muscle(s) become? Pedagogical problems of ongoingness, thought with inhalation-exhalation diaphragm physiological knowledges, generate a *provocation of muscle (as) process*. To wonder muscle process is to think muscle(s) as muscling, and to trace ongoingness beyond instrumentalism, as an active, demanding, tentative, and immersive engagement.

To think (a) muscle as generalized process is not innocent, nor sufficient because how muscles(s) matter as process is enacted in, and has consequences for, everyday practices with bodies in early childhood education. What ontologies of process mark what interests? To borrow

from Haraway (2016), with whose processes are we processing? Critical early years pedagogies and feminist science studies scholars who know the violence concealed when Science is deployed to justify Euro-Western narratives of progress and difference (Subramanian, 2014) lend resources for taking inhalation-exhalation physiological knowledges to account. For example, Rice (2016) outlines how specific, governmentally-sanctioned modes of process excel at thinking adipose (fat) tissue as ongoing in order to successfully subject fat cells to developmental logic, which conveniently allies with the neoliberal fat-fear mongering techniques that sustain the Euro-Western obesity apparatus. Understanding muscled work within a human-rooted ontology of process might sustain existing knowledge hierarchies in a similar way. For instance, thinking moderate to vigorous diaphragmatic work as a process for ensuring normative health perpetuates human-centered Physiological imperatives, which sustain Euro-Western systems of knowledge. Thinking muscle as only generalized, taken-for-granted process does little to attend to processes of flesh that might become imperceptible to dominant epistemological systems.

With Stengers (2010), attending to process becomes more than only thinking a system as ongoing in the sense that it does not stop, because process is a question of ethics and methodology and not simply of technique. This is a process concerned with a critical ongoingness, one that, as Holmes and Jones (2016) elaborate, “necessitates movements including stirring up our [in Canada, Euro-Western settlers] own ontological and epistemological (un)certainities” (p. 117). I want to attend to, and generate pedagogies that foreground, how muscle(s) are/do processes that are not concerned with quantifiable or predictable outcomes or that understand muscle only for its purposeful movement effects. I argue that thinking muscle(s) (as) unpredictable and continual processes infused with (in this case my pedagogical)

intentionality can mark one response to knowledges that theorize muscle(s) as ongoing in pursuit of normative and instrumental outcomes.

Rautio (2013) tucks into attending differently to vital processes, making clear how there are multiple modes of differential ongoingness in any moment, but that as humans (in this case, a Euro-Western settler human tackling Physiology), what I must take seriously is “how the potential of this generative difference realizes into new insights and directions in us: what do we take from it, how do we allow ourselves to be generated by it (albeit never fully controlling it)?” (p. 400). That is, thinking process and ongoingness is active and demanding. It means moving with/in (diaphragm) muscle(s) in ways that continually refuse any ongoingness intent on linear, tidy, or fully comprehensible processes. Provocations of muscle(s) as process tug upon ongoingness(es) that practice slowness (Stengers, 2011), that “eschew the straight, the automatic, the banal and the harmoniously polite” (Holmes & Jones, 2016, p. 116), and that become political when they insist on an ongoingness that refuses economic, quantifiable, or developmental processes (Myers, 2016; Rautio, 2013).

Muscling: Tending to muscling as process in our inquiry. Within our inquiry work, a (diaphragm) muscles (as) process provocation built of inhalation-exhalation physiological knowledges initially cultivated an attentiveness to tempo. We noticed how diaphragms moved quickly to shove a scream into fan blades and how chest muscles chuckled as voice waves bounced back. We narrated how, crouched adjacent to fans, diaphragms held steady and breath paused as fingers carefully slid sheets of paper between the protective slats of an electric fan’s casing, which then instantly transformed into gasping motions as paper was loudly sucked into the fan’s whirling. Holding an unsteady fan upright against the many pushing fingers pressuring it to collapse, I debated how (or if) tracing diaphragm tempo-transformations might be thinking

diaphragms as process. Is noticing transformations another method of rooting diaphragm muscle(s) in familiar notions of temporality that expect quantifiable and coherent changes in noticeable features? If to think diaphragm muscle(s) as process is a pedagogical provocation intent on taking physiological knowledges to account – one that requires caring for modes of ongoingness that do not submit to easily accessible forms of process – I must appreciate that only attending to diaphragm(s) as ongoing in their speed is insufficient. How are muscle(s) ongoing, differently?

What of the moments where diaphragm muscle(s) seem to pause in their ‘traditional’ or noticeable ongoingness? If neoliberal Euro-Western modes of process related to children’s muscle prioritize overt instrumental production of physically active movement, what happens in moments where muscle(s) refuse to participate in this process? Working to attend to instances of what might most readily seem obvious as diaphragmatic rest, I was drawn into the intense complexities of process entailed in pause. As one child sunk into cushy mats splayed across the floor, her shoulders flat across the plane of the ground and face buried in the plastic canvas, I noticed the minute motions that are in constant responsive fluctuation – the small, fast diaphragm inhalations and exhalations, the shimmying of hands from under her chest to make space for a stretching diaphragm, the collarbone angles that become uncomfortable as breaths add up and the mat compresses. This is a momentary muscling process of constant negotiation: process as the demanding labour in yielding. On the non-inquiry morning that I entered the inquiry space to pin some documentation to the wall and the room filled with bodies that did not notice the ‘absence’ of a provocation, I wondered how muscle(s) do not concern themselves with the ongoing threads of our inquiry provocations and find nourishment in other features and forces: process as the absurdity in ‘bringing’ muscle(s) to pedagogy.

As muscle (as) process moves beyond instrumental outcomes, and ongoingness is made perceptible as yielding and inadequacy, pedagogies of muscle that emphasize the forceful exertion of pedagogized muscles in service of governmental narratives are made increasingly unsteady. To frame movement or muscle(s) as stalled seems bizarre, as pedagogies that deploy diaphragms are exposed for their majoritarian political inclinations. What could be known as ‘resting’ or ‘stopped’ muscle in need of movement instruction/intervention matters as muscle(s) active amid a different ethic of process, a different logic of how muscle(s) are ongoing. This is not to argue that resting muscle(s) or creating opportunities for bodies to rest in education engenders resistive or ‘new’ possibilities for thinking muscle(s) pedagogically. Rather, I am pulling at the ways muscle(s) enact non-instrumental conceptions of process – how muscle(s) do activeness on many scales, with many entanglements – to propose that muscle(s) ongoingness is multiple. Inhalation-exhalation physiological knowledges, where yielding muscle contraction becomes a method for inviting air into a body, mark one teeny crumb of ongoingness.

Muscle(s) become a practice of specifically local muscled-process: a muscling, not a muscle; diaphragming pedagogies, not a pedagogy of the diaphragm. Importantly, this makes possible a muscling that is ongoing with its pedagogical entanglements. This is a process concerned with taking muscle(s) that have been made meaningful via Physiological logics, interrogating how these muscle(s) do with pedagogy, and then working to make Physiology’s understandings – and problems already generated – foreign with/in continually evolving provocations built with physiological knowledges. Muscle(s) are not just ongoing in their fleshed liveliness, but muscling as a pedagogical attunement is specifically, constantly, and intentionally ongoing.

Collective (Controlled) Diaphragms

Physiological knowledge: Controlled diaphragms. Nestled within a human brainstem, the nervous system control of diaphragmatic contraction enacted by ‘respiratory centers’ delineates another diaphragm physiological knowledge (Unglaub Silverthorn, 2007). Controlled diaphragm physiological knowledges purport that these respiratory centres receive hormonal, chemical, and neural signals from throughout the body, which are translated into demands for increased or decreased breathing activity. The diaphragm puts these neural signals to work as muscular contractions that lead to altered patterns of inhalation or exhalation. Controlled diaphragm physiological knowledges hold that brain-based control of breathing is largely unintentional (that is, that humans are not typically conscious of diaphragm work and do not have to ‘choose’ to breathe). However, under certain conditions, the diaphragm muscle can become a subject of conscious control. In these moments, neural and chemical signaling in ‘higher’ areas of the brain allow for humans to take control of breathing patterns and send voluntary, human agency-mediated signals to the diaphragm in order to regulate diaphragmatic contraction. Modes of control of the diaphragm are held stable and predictable, as both intentional and automatic control proceed in predictable ways. Within this logic, diaphragms become one of the few muscles made capable of moving in ways that are both voluntary and involuntary, intentional and automatic.

Pedagogical problem: How are muscle(s) accessed? Amid controlled diaphragm physiological knowledges, the diaphragm is a categorically complex, but dependably coherent muscle, always animated and activated by various brain-mediated and seemingly unconscious mechanisms. With pedagogies, controlled diaphragm physiological knowledges pose a problem of approach: *how can diaphragm muscle(s) be accessed and activated?*

Dance games, target-toss activities, meditation exercises, directions to move as a bear or caterpillar or a giant – physical literacy and activity resources for early childhood educators in Canada are rich with movement-promoting game suggestions for educators to utilize in practice. Typically, these activity descriptions are rooted in evidence-based research, where both the mode of delivery (the instructional techniques) and the content of the movement under description (the physical and motor development skills) have been investigated and validated within a specific epistemic paradigm. Within this dominant knowledge system, diaphragm muscles (and all muscles) are accessed as tools or resources. Educators are encouraged to create opportunities for children to use their muscles by providing a variety of activities that include agility, balance, and coordination skills (Canadian Sport for Life Society, 2016; Chronic Disease Prevention Alliance of Canada, n.d.). This assumes that muscles should be ‘active’ in specific, narrow constructions of physical activity founded on normative health and development dictates (for example, that children’s diaphragms should be contracting rapidly with high-intensity aerobic exercise). It also generates a mode of activity that is accessible via human-centered, outcome-oriented, quantifiable means (for example, correctly-activated diaphragms can be assessed by an educator who monitors a child’s breathing rate).

Pedagogical provocation: Noticing diaphragm participation. Post-developmental pedagogies, and the muscling I have thought with thus far, motivate a contestation of this precisely bounded muscled accessibility. Extending problems of diaphragm access and activation from controlled diaphragm physiological knowledges generates a pedagogical *provocation of diaphragm participation*. Who/what/where participates with/in (diaphragm) muscle(s) – and how?

To think muscled participation as more than a question of presence requires a targeted ethic of participation that responds to the human-centric, systematic, regulated participation allowed by controlled diaphragm physiological knowledges and pedagogies. While I might quite easily catalog many agencies that might participate in diaphragm muscle(s), – cellular energy, air, neuronal signals, food, exhaustion, cold viruses – to do this is to ignore *how* diaphragm muscle(s) can be accessed and activated, and obscures the ethico-methodological thread entailed in a provocation of diaphragm participation. Attending to diaphragm participation as an expansive endeavour where not only human actants compose diaphragm(s) requires shifting both our modes of noticing diaphragm(s) (breath, X-rays, coughs) and our ethical responses to diaphragm(s) – if breath is not just something bounded to my body, how am I accountable to breathing?

de Freitas and Palmer (2016) articulate a feminist new materialist ethic of participation with (a scientific concept of) gravity, where “bodies are newly assembled in the new arrangement, as they come to learn falling and flying as crucial dimensions of the potentiality of matter” (p. 1219). This openness to participation is risky, because by refusing to allow that bodies participate only alongside a material or concept or encounter, it holds that bodies are made with/in materials, concepts, and encounters (Pacini-Ketchabaw, et al., 2016). Detailing experimental dance practices with young children, Lenz Taguchi, Palmer, and Gustafsson (2016) extend this mode of participatory composition, arguing that muscled dance movements

open up a possibility for the children to be part of a body – an assemblage – that does not consist of organized and functional parts or forces...this assemblage composes and performs a body that in its complexity never takes on a final or definite form or

wholeness, but engages in exploring new and other possibilities of what a body might be and become productive of. (p. 710)

Post-developmental participation then, is more concerned with creating than counting, and incites pedagogies bent toward unfolding and constant composition rather than wholly appreciating every constituent piece. This is a participation that knows that “we become stone-carrying with carrying stones” (Rautio, 2013, p. 404); a participatory ethic that does not assume that things participate in or with muscle(s), but that muscles *are* participatory.

Muscling: Participating (with) diaphragms in our inquiry. Moving with a provocation of diaphragm participation in our inquiry work entailed a great deal of inadvertently overloading the participatory edges of muscle(s) and movement that we endeavoured to attend to. After our initial work with blowing paper, we invited electric fans into our inquiry. We suspected that different movements might provoke (other) different movements (Manning, 2014) and wondered how air forces not generated by diaphragms might extend the possibilities for thinking with motion. With fans, we noticed how busy fingers were with air, and we began to respond to/with/in moving to the habits of fingers, experimenting with how hands might negotiate the politics of who gets to push the fans’ buttons or how fingers can fling pieces of paper into forceful air currents. In a very short temporal burst, the fans attracted scissors, markers, tape, yarn, and stamps to the room. Muscle(s) started to matter as carriers of supplies, as releasers of paper projectiles, and as adult arms that face-palmed (and took deep, intentional diaphragm breaths) as we wondered how there were scissors present in the space, again. I debated how noticing and following these non-muscle materials might be an engagement with muscle(s). How do fans participate with/in diaphragm muscle(s)? Why might noticing how fans entangle with

diaphragm(s) matter? What is required to take seriously a pedagogical provocation of (intentionally specific) *diaphragm* participation? How do fans and diaphragm(s) muscle?

Rather than wondering how materials participate with diaphragm(s), a provocation of participation considers how diaphragms are made in/as participation. As a child and I kneel on the floor, our shoulders crouched over the small fan that lays flat in front of us, we lay tiny fragments of paper on the thick tines of a powered-off fan: diaphragm(s) momentarily made of patience and intention, of holding our breath as we fend off the disruptive force that a deep exhalation might bring to the precarious paper. While our fingers navigate the fan's blades, we do not overtly speak about safety but do observe the bounds of the fan's protective casing: participatory diaphragm(s) laced with risk, with concerns of protecting fingers, with politics that exceed an easily bracketed conception of what safety entails. As we talk about what might happen when the fan gets turned on, we consider how the paper might respond: diaphragm(s) participating with conversation, speculation, and care. When the fan powers up rapidly while we are both holding our faces quite close to the fan, we dissolve into coughs: diaphragm(s) made of surprise, interjection, and lingering cold viruses. When we gather pieces of now-dispersed paper and try to float them above the fan, we notice how tricky it is to for the air to hold the weight of the paper as we constantly stretch our torsos to collect fallen papers: diaphragm(s) temporarily participating with experimentation, failure, and entanglement.

Provocations of diaphragm participation animate problems of diaphragmatic access or activation, spinning any predominant emphasis on Science-rooted conceptions of neural control into a specific, transitive, and intensive consideration of how diaphragm(s) matter as participation. Any ontological vulnerabilities (Roy, 2007) carefully obscured by Euro-Western epistemologies set on predictability are made visible, as diaphragm access becomes a question of

involvement and creation rather than inevitability. Diaphragm(s) do participate in voluntary and involuntary neural circuits, but such participation brackets only a small splinter of their participatory capabilities. A provocation of diaphragm participation engenders a concern with the ‘how’ of muscle access, not an account of what should access muscle(s) – and thinking muscling with fans can only access one limited, situated array of diaphragm(s) participants. Posing controlled diaphragm physiological knowledges as a provocation of activation with pedagogies requires that we trace how material-discursive practices of childhood risk or of Physiological innervation interject in muscle(s), but then work to extend this expansive attention into the hard work of asking *how* muscled participation does *with* pedagogical practices. Echoing Lenz Taguchi et al. (2016), this entails moving with/in how paper, ethics, fingers, inquiry, aerobic exercise guidelines, fans, coughing, and diaphragms *do* bodies(s) – or, muscling – expansively, momentarily, and actively. This muscling is also a reminder of muscling(s)’ participatory borders – muscling is made with my pedagogical intentionality to take physiological knowledges to account. but these intentions do not nicely bracket the possibilities for how muscling unfolds. If I want to think muscle(s) as muscling while foregrounding muscle(s)’ collectivity, I need to take seriously how my muscling is exclusionary. What does my muscling ignore or obscure or prevent? What muscling(s) do my pedagogical intentions, the physiological knowledges I work to take to account, and the inquiry work moments I think with/in not hold space for? Muscling requires that I attune toward both expansive and exclusionary pedagogical problems, provocations, and participants.

Muscling (Diaphragming) Pedagogies

Diaphragms matter with/in this article because, with our early childhood education pedagogical inquiry work, diaphragms interject, yield, and do collectivity in specific,

consequential ways; because outcome-driven, inhalation-exhalation, and controlled diaphragm physiological knowledges are imbued with dominant neoliberal Euro-Western epistemological power; because diaphragm physiological knowledges pose problems of consequence, ongoingness, and access and activation with pedagogies; and because these problems generate pedagogical provocations of perceptibility, process, and participation. Diaphragm muscle(s) are not complex tools or objects of fascination for pedagogical inquiry, but rather work to muscle our pedagogies. In tracing how diaphragming pedagogies matter in one pedagogical inquiry, I have offered one example of how thinking physiological knowledges with pedagogies might be one practice for complexifying how muscle(s) happen in early childhood education. When neural control mechanisms of breathing, fans, inhalation-exhalation air pressure gradients, flu viruses, and exercising to breathlessness sheathe diaphragms with/in ethical and political pedagogical concern, maintaining the mess in thinking diaphragming pedagogies becomes critical. I have not attempted to figure a ‘new’ theory of muscling, but rather to propose muscling as a generative provocation for engaging with muscle(s) in early childhood education.

Throughout this article, I have drawn ‘muscle’ into ‘muscling’, which returns as a shared thread throughout this engagement with diaphragms. Verbing muscle is a doubled move, working from problematizing to provocation to problematizing. It shifts muscular fibers from a concept of structure or utility to concerns of activity, process, and entanglement. This shift complexifies physiological knowledges of muscular anatomy or function, while also being built of pedagogical provocations that draw physiological knowledges and pedagogies into different conversations that might generate different problems. Muscling, as I have argued, puts post-developmental pedagogies to work *with/in* muscle(s) to tug physiological knowledges and muscle(s) into different pedagogical entanglements than predominant Euro-Western pedagogies

permit. When muscling mobilizes post-developmental pedagogical intentions, muscle(s) matter as complex and active political, ethical, and pedagogical concerns.

What, then, do muscling pedagogies entail beyond this article? I have put forward muscling in an attempt to make clear how pedagogical intentions make varied muscling(s) perceptible and meaningful. ‘Muscling pedagogies’ is not a blanket construct, nor a pedagogical proposition that plays out consistently across multiple spaces, bodies, and intentions. In line with my specific pedagogical and political intentions, muscling pedagogies wonder what might be required for early childhood education pedagogies to claim (Willey, 2016), infiltrate, and contest dominant neoliberal Euro-Western epistemologies of muscle. These are pedagogies rooted in a muscling politics wherein settlers might complexify (and disrupt the hegemonic status of) Physiological structures built of canonical Euro-Western knowledges. For me, this entails asking how the muscle(s) that I participate in everyday perpetuate and/or complexify Physiological Sciences: how do the words I use (energy, jumping, sedentary) or the frames of reference (speed, strength, size) that I employ to appreciate muscle(s) invest in instrumental or stable understandings of muscle? How do the ways that I move my body (kneeling vs standing, trying not to let on when I am out of breath after running with children, pretending not to hear the popping sounds my knees make when I stand up quickly) obscure, or make visible, how Physiological Sciences extend into education spaces to inform my ability to move and to make meaning of muscle(s) in this motion? With muscling pedagogies, I am acutely conscious of how Physiology threads through my everyday encounters with muscle(s), but more importantly, I follow *how* the ways that I allow physiological knowledges to inform my muscled understandings make different muscle(s) possible. I am learning that sometimes I can ignore Physiology, sometimes Physiology is quite relentless, and sometimes I invest in Physiology.

Muscling reminds me that how I use Physiological Sciences as I do muscle(s) with pedagogies is an intentional and active decision, made within my specific privileged Euro-Western settler knowledge systems. My muscling(s) allow for specific muscle(s) and pedagogies to be possible, and thus muscling becomes another layer of pedagogical concern that I must be accountable to.

Muscling pedagogies also work toward a critical appreciation of the limited muscle understandings that are deemed acceptable within dominant discourses of physical education, development, or health promotion. Rather than detailing the consequences of dominant discourses of muscle, I argue that muscling pedagogies do critique; they *muscle critique* in specific moments. Muscling pedagogies refuse any reading of muscle(s) as already pedagogical or the infusing of pedagogies with muscle(s), and instead orient toward the intentional work of crafting muscling pedagogies. For example, I often say to children ‘I see your body moving very quickly’. As I think this phrase with muscling, I trace how my language actively makes specific understandings of muscle(s) possible and I wonder how I might make muscle(s) differently: *I see* (why do I need to see muscle(s) for them to be meaningful?) *your body* (when my pedagogical intentions are actively implicated in the muscle(s) made possible, why do I need to so clearly emphasize that these muscle(s) are not mine?) *moving* (why am I so quick to understand muscles only in terms of the purposeful movement they produce?) *very quickly* (I know that this frame of reference owes to neoliberal physical activity valuations of movement – why do I, and what happens when I, continue to think about muscle(s) in terms of movement intensity?). With muscling pedagogies, statements like ‘I see your body moving differently’ literally generate muscle(s) with pedagogies and, therefore, I need to be accountable to the entanglements of muscle(s) and pedagogies that I make possible.

Offering muscling pedagogies as a provocation for post-developmental early childhood education, I suggest that educators and researchers might take up the following questions to cultivate pedagogies with/in moving muscle(s): how can we generate pedagogies capable of doing muscle(s) that are collective, ongoing, and complex? Resisting narratives of pedagogical replication or prescription, how might muscling pedagogies continually cultivate intentional and particular problems that actively flood physiological knowledges with tension that turns immediately to upsetting these muscling pedagogies? How can muscle(s) matter with/in post-developmental early childhood education pedagogies? I put forward muscling as one method for doing muscle(s) when muscle(s) can no longer be considered a taken-for-granted, stable, Physiological pedagogical tool and instead become a lively pedagogical participant imbued with intentional ethical and political concern. This, I hope, contributes to ongoing post-developmental pedagogical interventions aimed at complexifying how bodies, flesh, and movement, *and* Euro-Western Physiological Sciences might be engaged beyond predominant pedagogical frameworks within early childhood education, and works alongside a much larger project of complexifying settler colonial bodied knowledge hierarchies in education.

Preface to Article 4

For the final article of my dissertation, I turn toward thinking with fat(s). With moments from our pedagogical inquiry work, I take up how I might research *with* fat(s) using the post-developmental pedagogies propositions that I practiced in Articles 2 and 3: creating pedagogical problems with fat(s) while crafting provocations designed to hold fat(s) to account beyond the criteria fat typically answers to in early childhood education. I detail some of the varied, tenuous fat(s) that we have encountered and produced, and I trace how these fat(s) converse with and complexify dominant Euro-Western constructions of fat. I work to activate what I understand as post-developmental fat(s) as a pedagogical provocation, rather than a stable or ‘new’ theory of how fat happens in early childhood education. In doing so, I hope to create space for thinking *with* fat(s) as emergent, entangled, and co-created fleshed matters and tend to how fat(s) might matter differently – with situated politics, varied answerabilities, and momentary pedagogical concerns – in early childhood education.

This article is intended for an early childhood education and childhood studies audience. I hope that my pedagogical focus can converse with post-medical, health geographies, and critical health and illness studies scholarship by multidisciplinary childhood studies scholars concerned with obesity, including Dr. Rachel Colls, Dr. Bethan Evans, Dr. Carla Rice, Dr. Emma Rich, and Dr. Megan Warin. While my work does not adopt the same place-based, physical culture, or obesity/health discourse analyses as these scholars, I believe that this article might contribute to the fat(s)-concerned childhood studies niche these theorists have carved.

I build ‘post-developmental fat(s)’ throughout this article because I have learned that fat(s), perhaps more than muscle(s), come loaded and coded with an incredibly complex web of meaning in Canada. Often when I share the topic of my research, I am met with the same set of

responses: ‘you are going to research *fat*? In *early childhood* education? Are you sure?’. As I answer these ‘why fat’ questions with a firm affirmative, I suspect that my questioners and I are literally speaking with dissimilar fat(s), and that the differences made in/of these fat(s) are of utmost consequence for dragging questions of *why* someone might want to think fat into propositions of *how* thinking with fat(s) might matter to early childhood education pedagogies.

When I say that I am researching with fat(s), often dominant Euro-Western discourses of understanding flesh (Beausoleil & Ward, 2010; Freidman, 2015; McPhail, 2013; Rice, 2016) swallow my words and spit them back to my conversation partners as ‘obesity’. When I speak of fat(s) and early childhood education, I do not always notice when ‘fat(s) and childhood’ starts to sound like ‘fat children’ (Elliot, 2016; McPhail, Beagan, & Chapman, 2012; Petherick & Beausoleil, 2016; Rice, 2007; Ward, 2016). As I wrote this article, I wondered how ‘you are going to research *fat* in *early childhood education*?’ might put words to the complexities in thinking with fat(s) amid much larger political projects tuned to rethinking ontologies of education, matter, politics, and life. Noticing how the word ‘fat’ rolls across my tongue and makes friends recoil, colleagues chuckle, and established scholars wish me luck, the cautioning questions against making tangles of fat(s) and childhoods explicit feel like the knowledgeable, exhausted, fierce high-fives of feminist science studies and post-developmental pedagogies scholars who have fielded variations of these same questions over lifetimes. ‘Are you sure?’ becomes an ethical problem, an attention to who does not want to, or cannot, speak of/with/in fat(s) in early childhood education. Post-developmental fat(s), then, are a reminder that ‘fat(s)’ are not a universalized, intact pedagogical proposition: I need to articulate the fat(s) I mobilize in line with the partial politics and ethics, as I discussed in my overall introduction, that I think these situated fat(s) with.

Article 4.**Valuating, Fitting, Tending, and Counting with
Post-Developmental Fat(s) in Early Childhood Education****Abstract**

This article responds to Euro-Western conceptions of childhood obesity that understand fat within developmental narratives, as biochemically consequential, and as a marker of individualized responsibility. Drawing in multiple fat(s) generated in a pedagogical inquiry with early childhood educators and children, I articulate ‘post-developmental fat(s)’ as fat(s) that trouble the logics, practices, and relationships required to understand fat as obesity. I trace how situated methods of valuating fat(s) produced a pedagogical provocation of fitting fat(s) and how modes of tending fat(s) generated specific possibilities for counting fat(s). Foregrounding questions of how fat(s) happen and what fat(s) can do in early childhood education, I take seriously how fat(s) matter momentarily amid intentional, speculative, and deeply politicized pedagogical practices oriented toward doing fat(s) differently in early childhood education.

Keywords: post-developmental pedagogies, early childhood education, health education, fat, childhood obesity

How do fat(s) become a concern in early childhood education? How, and why, might thinking with fat(s) matter to early childhood education pedagogies? For dominant Euro-Western understandings of fat rooted in contemporary neoliberal obesity discourses (Beausoleil & Ward, 2010; Guthman, 2013; LeBesco, 2011; Rice, 2016), fat matters because of the biochemical consequences it enacts (Bacon & Aphramor, 2011), because of developmental logics which hold that fat children become fat and unhealthy adults (Evans, 2010; Rich, 2011), and because fat emerges as an arbiter of personal responsibility, bodied legitimacy, and valued citizenship (Freidman, 2015; McPhail, 2013; Rice, 2007; Ward, 2016).

Responding to these hegemonic enactments of fat, this article wonders how fat(s) happen in early childhood education in less familiar, tentative, and uncertain modes. I begin by outlining how I bring post-developmental pedagogies and feminist science studies together to inform the pedagogical propositions I work with in this article. After detailing the pedagogical inquiry work with early childhood educators and children that animates this article, I articulate ‘post-developmental fat(s)’ as fat(s) that are always in conversation with dominant developmental conceptions of fat *and* relentlessly trouble the logics, practices, and relationships required to understand fat as obesity in contemporary Canada. Drawing in multiple fat(s) generated with early childhood educators and children, I trace how situated methods of valuating fat(s) produced a pedagogical provocation of fitting fat(s) and how our modes of tending fat(s) generated specific possibilities for counting fat(s). As I elaborate these fat(s) and their transitory entanglements with yoga pants, mat forts, snack time, statistics, and wheel barrows of soil pushed through the forest, I foreground how post-developmental fat(s) are wholly situated and never pre-articulate. Centering questions of how fat(s) happen and what fat(s) can do in early childhood education, I

make visible how fat(s) matter momentarily amid intentional, situated pedagogical practices oriented toward doing (with) fat(s) differently in early childhood education.

Making Fat(s)

If I am thinking with – or encountering, or making, or attending to – different fat(s) than conventional Euro-Western obesity discourses, questions of how fat(s) come to be made multiply matter to my project of taking fat(s) seriously with early childhood education. To consider that fat(s) are ‘made’ extends upon conceptions of fat fabrications (Evans, Rich, Allwood, & Davies, 2005) or the obesity assemblage (Rich, 2010), which describe the machinations through which fat becomes knowable as obesity within larger human-centered neoliberal systems of coding and constructing flesh. Fat(s) are made perceptible, consequential, or meaningful in a multitude of ways in early childhood education: as obesity, as nutrition choices, as body composition measurements, as the fat that I carry in my body as I move through a classroom. Importantly, and as I will detail throughout this article, fat(s) are made differently within different arrays of practices and pedagogical intentions.

Within the larger scope of my work¹, I have argued that early childhood education pedagogies can take physiological knowledges, and the Physiological Science epistemological canon, to account by claiming, inhabiting, and re-deploying pedagogies made perceptible with/in physiological knowledges (Article 1, Article 2, Article 3, in this dissertation). In this article, I

¹ My explicit concern with physiological knowledges is rooted in post-developmental pedagogies (Blaise, 2014; Rautio & Jokinen, 2015; Taylor & Pacini-Ketchabaw, 2015), feminist science studies (Haraway, 2016; Willey, 2016; Roy, 2007), and post-qualitative education research (Lather, 2016a; Lather & St. Pierre, 2013; MacLure, 2013; St. Pierre & Jackson, 2014). These theories utilize Euro-Western knowledges aimed at upsetting colonial epistemic habits – an imperfect and contested (Roy & Subramaniam, 2016; Todd, 2016) proposition – to make highly regulated settler colonial ways of knowing and doing flesh accountable and answerable to different entanglements and concerns than these epistemologies typically encounter.

foreground a pedagogical intention that extends my focus on being accountable to physiological knowledges into a concern with working predominant conceptions of fat(s) – which are deeply intertwined with physiological knowledges and Euro-Western epistemic hierarchies – toward different pedagogical answerabilities. Making fat(s) perceptible, with post-developmental pedagogies, as ethical, political, and pedagogical concerns is only one method for complexifying how fat(s) might be made in early childhood education. I understand the post-developmental and feminist science studies theories that I utilize, and my practices for thinking fat(s) with pedagogies, as a specific, bounded, and contested (Roy & Subramaniam, 2016; Todd, 2016) strategy, that works alongside a multitude of non-Euro-Western interventions, for confronting colonial knowledge systems and their lived, fat(s)-fleshed consequences.

Doing Fat(s) with Post-Developmental Pedagogies

I utilize post-developmental early childhood education theorizing in two ways in this article. First, I think with post-developmental pedagogies to articulate a framework for doing fat(s) with pedagogies. Then, as I deploy this practice, I pick up various post-developmental enactments of pedagogy to build a discussion of what ‘post-developmental fat(s)’ might demand of the post-developmental pedagogies these fat(s) are intentionally crafted with/in. In this section, I address this first tangle of post-developmental theorizing by explaining how I think fat(s) with pedagogies in this article.

Post-developmental early childhood education aims to create pedagogical entanglements that disrupt dominant Euro-Western developmental narratives and the modernist educational approaches promoted by colonial conceptions of normative, universalized developmental trajectories (Burman, 2016; Dahlberg, Moss, & Pence, 2013; MacNaughton, 2003; Olsson, 2012). Detailing the powerful links between developmentalism and dictates of normativity and

citizenship, post-developmental theorizing describes the governmental function and strict understandings of children's learning allowed by pre-articulated or stable pedagogical imperatives, including how these dominant pedagogies devalue alternative conceptions of learning and childhood (Canella & Viruru, 2004; Kessler & Swadener, 1992; Pacini-Ketchabaw, Nxumalo, & Rowan, 2014). Post-developmental pedagogies provide one alternative to dominant Euro-Western pedagogies by positioning childhood and education as lively experiences that become meaningful with the multiple, situated, and ongoing activities, relationships, politics, responsibilities, and complexities that co-create contemporary childhoods (Blaise, 2013, 2014; Lenz Taguchi, 2011; Rautio, 2013; Rautio & Jokinen, 2015). Importantly, post-developmental pedagogies *do* pedagogy as a constantly negotiated, intentional, demanding process (Iorio, Hamm, Parnell, & Quintero, 2017; Nxumalo, 2017; Pacini-Ketchabaw, Kind, & Kocher, 2016; Rautio, 2017); pedagogy is a practice of attending to what must be learned, and how, within the accountabilities and answerabilities generated by a unique, momentary, and situated array of pedagogical participants.

In this article, I utilize a post-developmental pedagogical practice that entails two propositions: (1) making fat(s) a problem *with* pedagogies while (2) crafting pedagogical provocations capable of holding fat(s) to account with pedagogical complexities. To generate pedagogical problems with fat(s), the first proposition, I borrow from post-developmental scholars who detail how pedagogy is always ongoing and always intentional. Intentionality, here, becomes a practice of responding to the precise ethical and political tensions that are foregrounded by researchers, educators, children, and more-than-human others who participate in creating pedagogies (Blaise, Hamm, & Iorio, 2016; Pacini-Ketchabaw et al., 2016; Taylor, 2017). I develop this proposition further with Stengers (2008), a feminist science studies scholar,

who details how “connections are something that must be created...this is the only way of succeeding in creating problems rather than receiving them readymade” (p. 9). Taken with post-developmental pedagogies’ attention to the active work of pedagogy, this means that I cannot assume that fat(s) already pose problems *for* pedagogy or that pedagogies have already addressed all the demands that fat(s) might make of them. Rather, I must work to generate pedagogical problems *with* fat(s), creating problems that are sticky and tense and rich and that knit pedagogies with fat(s) in ways that might draw fat(s) into unfamiliar pedagogical entanglements.

The second proposition of my pedagogical framework involves crafting pedagogical provocations that might hold fat(s) to account beyond the typical standards or criteria fat(s) answer to in Euro-Western education (like evidence-based programming standards for ensuring children get adequate exercise each day). With this proposition, I take the problems that I have generated *with* fat(s) *with* pedagogies and move toward creating provocations that I can take up with moments from a completed pedagogical inquiry, and in future work. As I create provocations, I borrow from post-developmental scholars who detail how pedagogies constantly tangle and re-tangle bodies, places, knowledges, and materials together in lively, slippery, consequential knots (Early Childhood Pedagogies Collaboratory, n.d.; Hodgins, 2014; Nxumalo, 2017). From these scholars, I know that the provocations that I generate are precise, bounded, and non-universalizable – and that because these provocations are consequential, I need to be answerable to the provocations I make possible. Fat(s) matter, and because they matter, they mark and re-mark (Barad, 2007) bodies and possibilities for life. In creating pedagogical provocations with fat(s), I am not working to create provocations for the sake of provocations. Fat(s) are too consequential for this. I need to create provocations that require that I become ‘answerable’ (Willey, 2016) to the fat(s) that I participate in making *and* that drag these fat(s)

into relationships that stretch beyond the accountabilities fat assumes in predominant Euro-Western pedagogical configurations. My provocations must attend to how fat(s) can be crafted with difference, such that what Euro-Western obesity dictates might take to be ‘fat’ might matter as an array of complex, differently perceptible, unevenly lived fat(s). I need provocations that know that fat(s) are not abstracted, nor are they simply flesh subjected to anthropocentric apparatus – fat(s) are made in many ways. The pedagogical provocations that I create must submit fat(s) to answerabilities and accountabilities that function to unsettle predominant ways that fat(s) are made to matter with everyday educational practices, while knowing that these provocations are imperfect, bounded by my situated and precise pedagogical intentions, and far from the only method for doing fat(s) differently in early childhood education.

Pedagogical Inquiry

This article draws upon a pedagogical inquiry focused on bodies and movement in early childhood education. As part of an ongoing multi-year collaborative research program at an urban child care center in British Columbia, educators, children, families, and pedagogical facilitators think collectively about how pedagogy happens, and what everyday practices of education do, in the emplaced entanglements of a mid-sized Canadian city. Together, we participate in ‘inquiry work’, which brings pedagogical documentation (Hodgins, 2012; Pacini-Ketchabaw, Nxumalo, & Kocher, Elliot, & Sanchez, 2015) together with a shared ethic of thinking pedagogy expansively, politically, and ethically in response to the settler colonial, humanistic, child-centered, and normative developmental tendencies of mainstream Euro-Western education (Taylor & Pacini-Ketchabaw, 2015). Crafting ‘provocations’ intended to unsettle our habitual engagements with everyday events, educators and facilitators inquire with children as we gather documentation, generate questions, follow the unpredictable lanes of

interest that emerge from within the work, and carefully wonder the possibilities for doing pedagogy relevant to the tensions and challenges children will inherit. We understand pedagogy and inquiry to be wholly intertwined, as the problems, tensions, wonderings, and provocations we generate and encounter emerge with/in everyday moments of pedagogy, and continually re-inform our possibilities for thinking pedagogically. In the inquiry with bodies and movement that informs this article, we foregrounded our intention to move with more-than-human actants, to attend to how movement happens politically, and to carefully experiment with uncertain possibilities for how bodies can move in early childhood education.

I participate in this project as a pedagogical facilitator and researcher. In this multi-faceted role, I join educators in thinking deeply about pedagogy while crafting pedagogical documentation that can participate in larger conversations beyond the child care center. As Nxumalo (2014) has detailed, acting as a pedagogical facilitator and researcher requires my careful, constant negotiation of my embeddedness as an actively uncertain co-participant in inquiry work, as well as an answerability, to all participants in inquiry work, for how our moments of inquiry are engaged in my writing. In this article, I use the language of '*our*' inquiry practices to refer to the collective ethic that children, families, educators, and pedagogical facilitators/researchers practice. While I speak of inquiry work from my perspective, I often use '*we*' to make clear how my experience is always knotted with the tensions, response-abilities, and accountabilities of thinking pedagogically that we negotiate together. This emphasis on accountability is also why I frequently return to my bodied fat(s) and my practices of making/doing fat(s) throughout this article. As we inquired with movement, I learned that foregrounding fat(s) is a loaded proposition that demands risk from children, educators, and researchers as we confront fat(s) in everyday life. Inquiring with fat(s) is hard. While I know that

it is an imperfect, anthropocentric, and privileged strategy, in taking up the problems and provocations in this article, I often feel that I can be most answerable to the fat(s) that we generated in inquiry work by rooting examples with/in my body. I turn now to two entangled overarching fat(s) that we met in inquiry work: developmental and post-developmental fat(s).

Developmental and Post-Developmental Fat(s)

Developmental fat(s) are familiar to people living in Euro-Western spaces. They are the fat(s) that populate calorie labels on snacks and that lurk behind upbeat body-positive gym membership advertising. These fat(s) are crafted amid dominant Euro-Western practices of making flesh knowable, where Science and Biology dictate frames of reference for how humans might engage fat(s). These governmentally allowable epistemological structures for confronting fat(s) have been elaborated as ‘fat fabrications’ (Evans, Rich, Allwood, & Davies, 2005), ‘obesity assemblages’ (Rich, 2010), or ‘fatuous measures’ (Guthman, 2013), and make fat(s) in specific, strategic modes. Developmental fat(s) are made to be quantifiable, to be human-centered, to be tracked in terms of health consequences, and to matter as social stigma and gendered weight-based oppression. Developmental fat(s) invest in trajectories that decisively assert that fat children become fat adults (Elliott, 2016; Evans, 2010; Evans & Colls, 2011). These ubiquitous narratives of normative childhood development allow for the creation of fat phobic and fat mitigating curriculum, which reminds children and educators that it is their personal responsibility to become healthy adults, whereby health can be achieved through carefully controlled practices of healthy eating (or, consumerism) and exercise (or, self-discipline).

At the nexus of mainstream biological epistemologies and fleshed developmental logics, fat is made as obesity (Bacon & Aphramor, 2011; Rice, 2016; Rich, 2011). With obesity,

developmental fat(s) become perceptible as flesh that subscribes to linear conceptions of temporality and endurance, as fat that is biochemical, as tissue that can become catastrophic to bodies, as adiposity subject to individual human agency, and as a bodied material that responds to human-rooted practices of intervention. Elsewhere, I have traced how developmental fat(s) become differently consequential with varied Physiological fat knowledges (Land, 2017) and how human-centered developmental fat(s) strategically bracket possibilities for relating with fat(s) in childhood (Land, 2015). Developmental fat(s) delimit a precise array of relations with fat(s), whereby only relations that recursively sustain the dominant obesity apparatus within which they are manufactured are made perceptible. This generates fat(s) relations saturated in repulsion, responsibility, analysis, predictability, reduction, and control.

Post-developmental fat(s) are made intelligible with post-developmental education frameworks. Euro-Western knowledges that frame flesh as ontologically accessible, biochemically quantifiable, and materially stable are infiltrated by fleshy bodies that are constantly participatory (Lenz Taguchi, Palmer, & Gustafsson, 2016), imbricated in multiple material fluctuations (Barad, 2007; Mol, 2002), and threaded with an attunement to divergent possibilities for doing biologies critically (Willey, 2016; Wilson, 2015). These fat(s) are concerned with/in human bodies, but demand modes of attention that are disloyal to Euro-Western human-centered bodied politics.

Post-developmental fat(s) provoke response-able (Haraway, 2015) engagements with mainstream developmental logics of childhood. Thinking post-developmental fat(s) with pedagogies, I argue that attending to post-developmental fat(s) demands that we differently encounter the contested, fleshed politics that children and adults unevenly inherit. Post-developmental fat(s) do not pretend that fat(s) are biochemically inert, nor do they apolitically

refute that fat(s) impact possibilities for life. Rather, they orient toward *doing* fat(s) pedagogically as they wonder how fat(s) matter differently, with different places, with different bodies, with different practices of making fat(s) matter. Post-developmental fat(s) do not ignore obesity discourses, but they do not rest with making clear how obesity functions as a tool of neoliberal governance. Troubled by the pedagogical purview of developmental fat(s), post-developmental fat(s) demand active, ongoing, intentional, and uncertain practices capable of critically thinking with fat(s). They create, and are created by, conditions for relating with fat(s) in less-familiar ways, whereby fat(s) relations might be accountable to dominant logics in the same moment as they toil to unsettle such discourses and cleave space for different connections, tentative modes of critique, or provisional methods for attuning otherwise with fat(s).

I trace these two enactments of fat(s) not to draw a binary between developmental and post-developmental fat(s), or to frame post-developmental fat(s) as an aspirational pedagogical imperative, or to obscure alternative engagements with fat(s), but to inhabit the continually remade incommensurability between these two fat(s): developmental and post-developmental fat(s) are made with differences that matter, but are not simply an inverse of one another. Post-developmental fat(s) matter *with* developmental fat(s). As I participate in post-developmental fat(s), I am not concerned with only articulating critiques of developmental fat(s), but work instead to infiltrate developmental fat(s), insistently unsettle their carefully curated ontological stability, and actively toss (and re-toss) fat(s) into intentional, speculative pedagogical conversation. Post-developmental enactments of fat(s) are accountable to the fat(s) they complexify because of the uneven, politicized complexities I choose to (or can) attend to. No fat(s) are innocent or inert in intricate lifeworlds

With the pedagogical inquiry moments that I think with in the following sections, the problems, provocations, and fat(s) that I foreground are my attempt to work through how I might, and how I often fail to, create conditions for doing fat(s) post-developmentally. There is nothing about the moments that I think with that are especially or always conducive to post-developmental fat(s); that they are mostly mundane moments serves to emphasize the intentional, ongoing work in doing fat(s) post-developmentally. I think fat(s) with yoga pants, mat forts, snack time, statistics, and wheel barrows of soil to chase down moments when fat(s) are momentarily made post-developmental and probe *how* we made/make fat(s) matter as post-developmental fat(s). I also notice when my pedagogical intentions to think fat(s) differently do not pan out and reassert developmental or habitual neoliberal pedagogical enactments of fat. I argue that we might craft post-developmental fat(s) as a specific, persistent, non-universalizable labour of (re)caring, (re)disrupting, and (re)tending fat(s). Where fat(s) become lively, post-developmental fat(s) are not already perceptible or pedagogical, and developmental fat(s) are not ontologically pre-given.

Valuating Fitting Fat(s)

‘Fat’ makes zero appearances in the British Columbia Child Care Licensing Regulations (Government of British Columbia, n.d.), the government document that regulates early childhood care services in the province. Despite the conspicuous absence of the language of ‘fat’, fat(s) are far from irrelevant within these licensing regulations. As the regulations decree that “a licensee must establish a program to instruct children in, and to practise the rules of, health and hygiene” (Part 4, Division 1, 46[1]) fat(s) become carefully obscured amid a palatable umbrella of ‘health’. Where a licensee must “promote healthy eating and nutritional habits” (Part 4, Division 1, 48[1b]), fat(s) are deployed in service of logics of consumption, behaviour, and metabolism.

As practitioners are required to provide programming containing “activities that encourage good health and safety habits” (Schedule G, 1c), fat(s) reverberate with traces of exercise, health, personal responsibility, and notions of developmentally-appropriate behavioural routines. These invocations of fat(s) that are conveniently and seamlessly made secondary to neoliberal conceptions of health or wellness do more than simply rename, relabel, or repackage fat(s) amid more politically expedient concepts. Rather, these fat(s) are made with/of (e)valuating practices, where systems of knowledge allow for fat(s) to be assessed a valuation or lent a quantifiable position or hierarchical character amid concepts that work adjacent to fat(s). When ‘health’ is allowed a presence in licensing documents but fat(s) are not, this is not simply because ‘health’ is imparted a more acceptable connotation with childhood or deemed a more easily enforceable construct. Rather, this obscuring of fat(s) as health requires a scheme of making fat(s) as (e)valuatable. Once fat(s) become relevant to practices of valuating, fat(s) can then be made as a non-vital constituent of health, which requires that they be value-able as a background agency readily expendable in service of perpetuating discourses of normative health.

Pedagogical Problems with Valuating Fat(s)

Crafting (e)valuatable fat(s) as a problem with pedagogies raises questions of how flesh becomes subject to logics of (e)valuation: what is required of fat(s) in order for fat(s) to submit to classification systems where fat(s) can be obscure(d) as health? Making fat(s) as (e)valuatable plugs into problems of progress-oriented, (so-called) rational and objective assessment tendencies in early childhood education pedagogies (Dahlberg, Moss, & Pence, 2013; Moss, 2016; Pence & Pacini-Ketchabaw, 2008). How incessant must valuating practices be for fat(s) to be injected with Euro-Western neoliberal educational procedures for evaluating life in specific, quantifiable, governmental terms? What modes of (e)valuating (with) fat(s) are made possible in

early childhood education? Multiple post-developmental educational scholars think otherwise with early childhood practices of (e)valuating beyond hegemonic anthropocentric, developmental, and quantifiable logics (Jones, Osgood, Holmes, & Urban, 2016; Jones, Rossholt, Anastasiou, & Holmes, 2016; Nxumalo, 2016; Ritchie, 2016). Borrowing from these scholars, taking seriously how fat(s) are evaluat-able as health in licensing regulations is a call to interrogate how pedagogies participate in differently politicized practices of making, contesting, and refusing dominant and disruptive events of (e)valuating. This makes perceptible a pedagogical problem of (e)valuating fat(s); of inhabiting practices that imbue fat(s) with intentional significance and attending to how these practices might deploy fat(s) as differently active participants in familiar and unfamiliar schemes of making fat(s) matter.

How do fat(s) write problems of (e)valuating with pedagogies? How might fat(s) made as valuable (as worthy of concern, as marked by an intentional engagement) become fat(s) made as (e)valuable, where evaluation matters as a technique of normative neoliberal quantification (Guthman, 2013)? How might practices of appraisal, of claiming that ‘fat(s) matter with pedagogies’, become practices of making violent positivist assessments of significance, legitimacy, and utility, of saying ‘fat(s) matter to pedagogies because we should prevent children from becoming fat’? Rather than concentrating on the mechanics of how fat(s) are evaluated, which have been well-elaborated (Beausoleil & Ward, 2010; Evans, Rich, Allwood, & Davies, 2005; Rich, 2010), my attention to post-developmental fat(s) is concerned with the pedagogical potential entailed in infiltrating problems of (e)valuating fat(s). This requires tracing how we (e)valuate with fat(s) in early childhood education. As Jones, Rossholt, Anastasiou, and Holmes (2016) submit valuating practices to the “immeasurable stuff of education” (p. 29), I argue that (e)valuating fat(s) becomes a problem of how we might (e)valuate fat(s) when valuating is an

always unfurling array of collective, ongoing, and imperfect practices. With Nxumalo (2016), valuating practices demand sticking with the uncertain, specific, tense, and consequential – and always necessary, always inescapable – ethics of being complicit in valuating. (E)valuating fat(s), then, crafts pedagogical problems of thinking fat(s) as they become continually re-entangled with the (e)valuating practices I/we assemble with/in fat(s).

Making valuating fat(s) a problem with pedagogies effects questions of how fat(s) that are continually valued might matter differently with early childhood education practices: how might fat(s) that refuse to be evaluated against neoliberal standards participate in pedagogies? How can valuating practices with fat(s), with pedagogies, become provocations for thinking fat(s) expansively while remaining tightly attuned to the politicized consequences of fat(s)? As a body constantly entangled with differential fat(s), how can I be accountable to the valuating I continually do with fat(s)? Where developmental fat(s) ask why fat(s) are (e)valuatable and (e)valuated in certain ways, post-developmental fat(s) borrow this impulse toward imbuing fat(s) with concern to wonder the pedagogical richness of valuating with fat(s), where (e)valuating practices are provisional and purposeful and political.

(E)valuating fat(s) with pants in our inquiry. Each morning before heading to our pedagogical inquiry, I thought carefully about how I should dress my body. To think with/in moving demands moving and moving demands, for me, an attention to clothing, which demands an attention to fat(s): do I wear adulting pants with structure, which might dig into my skin as I crouch on the ground? Do I wear high-waisted stretchy yoga pants, which hug my legs and are generous to the parcels of fat(s) in my body? With yoga pants, I cannot tuck my shirt in, which means no being upside down. Jeans often slow down my movements as I yank at their thick fabric. I select yoga pants every time. I wonder how my pant selections manifest as an

engagement with valuating fat(s): how might my pant debates entangle with inquiry work and with fat(s) as more than a question of ‘I feel good in this’ or ‘this is appropriate professional clothing’? How might jeans that pinch my sides make possible different pedagogical engagements with fat(s) than stretchy pants? When I select yoga pants, I am valuating fat(s) and, in doing so, I am making a very tiny pedagogical decision. I choose to delimit a specific set of possibilities for how my body might move, therefore taking these pants as pedagogical participants with fat(s), with movement, with different bodies, with different fabric. I am intentionally valuating with fat(s), with pedagogies, and this valuation entails accountability to the fat(s) potentialities made possible. Importantly, as I think with the fat(s) that I make possible with the practices that I use to (e)valuate fat(s), I am foregrounding the *activity* of valuating fat(s), not the actual pants that I choose. Pant choices are one teeny, everyday way that I value fat(s) and I have selected this example because it is mundane not because it is especially instructive. There are a multitude of other ways that I (e)valuate fat(s) that also demand my attention, from minute to macro-valuations: the food choices I make around children, the way I speak about bodies with children, or the way that I language fat(s) in everyday encounters.

Am I evaluating or valuating with fat(s) when I make pant decisions? Jones and Rossholt et al. (2016) rethink valuating practices as a splintered composition of meaning in motion, whereby “situating quality [valuating] in the present means that, in every situation...the way in which all the different elements interrelate will be so complex that we will not be able to immediately comprehend the situation or the event” (p. 35). How can I value with fat(s) as uncertainty, as an ongoing pedagogical endeavour that does not conclude when I pick yoga pants because yoga pants do not make perceptible firmly bracketed, completely containable fat(s) nor do pedagogical practices already understand what yoga pant fat(s) valuating might possibly mean

in this moment? When I think the act of putting on yoga pants as an intentional – and privileged and small and situated – decision to think fat(s) post-developmentally, rather than a positivist judgement capable of knowing how this might make fat(s) matter, I do valuating as “an experiment that unfolds and responds to the events of schooling” (Jones & Rossholt et al., 2016, p. 36).

Doing valuating as ethic of responding and entanglement, Nxumalo (2016) articulates how certain enactments of (e)valuating silence various responses and therefore strictly prescribe possibilities for being accountable to pedagogical complexities. How can I think valuating as “experimental gestures toward refiguring quality [valuating] practices as lived–affective–performed–productive interferences in colonizing more-than-human relations” (Nxumalo, 2016, p. 47), where to choose yoga pants as a method of valuating with fat(s) occurs within a (not only human) lived world of unevenly consequential (fat) politics? When I think yoga pant fat(s) choices as interference and as privilege, I think valuating practices as hard confrontations with existing political systems whereby I must be accountable to my practices of valuating with fat(s): how are the fat(s) I make pedagogically perceptible when I value with fat(s) relevant to the fat(s) that children encounter and inherit?

It matters if, and how, the fat(s) that I make perceptible when I choose yoga pants are developmental or post-developmental, or negotiated in collisions of these fat(s). Valuating with post-developmental fat(s) requires practices that value with, pause in, and revalue fat(s) continually. Valuating does not concern itself with resolutely naming fat(s) as developmental or post-developmental because valuating is ongoing. As it unfolds, valuating makes possible fat(s) that necessarily totter the nexus of developmental and post-developmental. Perhaps when I pick yoga pants because I am feeling grumpy and unconfident, I am evaluating fat(s) as something I

want to ignore, which might make developmental fat(s); these fat(s) matter because children inherit these fat(s) in dominant Euro-Western spaces. Maybe when I select yoga pants because I am thrilled by the movement provocation we are offering and anticipate a great deal of my body moving, I am valuating fat(s) as part of my practice of making bodied space, an engagement with fat(s) that trends more post-developmental; these fat(s) matter as active pedagogical participants. When I choose yoga pants because they do not squeeze my body in awkward ways, I am (e)valuating fat(s) as agencies that are relevant interjectors in my pedagogical engagements but that I can intentionally choose to obscure, making a fat(s) that matters as developmental and post-developmental; these fat(s) also matter, differently, as children and adults grapple with what these fat(s) do with pedagogies. These developmental or post-developmental fat(s) implicate my valuating practices in how they come to matter because both my valuations and fat(s) are momentary, situated, and ongoing. Fat(s) are *made with* my intentional valuating practices, and with a multitude of other actants, and I need to be accountable to both the fat(s) that my valuating makes possible and *how* my valuations knit fat(s) and pedagogies in entanglements that both unsettle and echo predominant Euro-Western developmental conceptions of fat.

Pedagogical Provocations of Fitting Fat(s)

Valuating fat(s) with yoga pants, I participate in multiple practices of fitting fat(s): concerns with fitting my bodied fat(s) into clothes or expectations or comfort, practices of fitting into the currents of movement in a space, and of activating fat(s) that fit with the ethical threads of our inquiry work. Taking ‘fitting’ fat(s) as a pedagogical provocation built with/in pedagogical problems of (e)valuating fat(s) requires attending to the multitude of ways that ‘fitting’ happens with/in early childhood education. With licensing documents, fitting fat(s) demand questions of ‘is this healthy?’ or ‘does this meet licensing regulations?’ as fat(s) are

made to fit within pre-existing neoliberal constructions (Government of British Columbia, 2016). As nap time mats become fort walls in our movement inquiry, as I describe below, space is (re)configured and relations of fitting fat(s) become momentary experiments in how bodies might fit with/in a structure. These fitting fat(s) relations are not stable, nor are they pre-articulate. Rather, fitting fat(s) practices and relations are intertwined with valuating practices and are made as (momentary, transitive, uncertain) developmental and post-developmental fat(s). Taking fitting fat(s) relations as a pedagogical provocation becomes a question of what fitting fat(s) relations might do.

Fitting fat(s) with mat forts in our inquiry. As floor mats from the nap room initially entered our movement inquiry, the mats often laid flat across the plane of the floor and invited movements that played out parallel to the ground. Becoming more familiar with the mats, we wanted to extend these flat mat events by propping the mats unsteadily on their thin edges or balancing the mats against chairs and tables to pause their large, flat surfaces from lying flat against the floor. Many children, educators, and researchers began to construct forts and walls. Crafting enclosed spaces, making shapes that required entrance, and creating areas where the easy flow of bodies was complexified by the presence of waist-high mat interjections animated our moving. As children and adult bodies made and negotiated these momentary spaces, fat(s) relations of fitting became differently perceptible. Crouched under a small square table encircled by mats, a child invited me to join her in a ‘fort’, and as I weighed if my limbs entering her space was even a possibility, fat(s) relations of fitting concerned with anthropocentric assessments of displacement and volume emerged (Manning, 2012). In wondering if my body might join the space, I invoked a fat(s) that is profoundly developmental: a fat(s) that assumes steady demarcations between the fat(s) beneath my skin and other lifeworlds; a fat(s) that takes the

spatial arrangement of the mat fort to be stable and quantifiable; a fat(s) that submits to politics of adult bodies needing to comfortably occupy space suitable to the contours of their stature; a fat(s) that assumes that I can best, and accurately, assess how space might respond to my bodied fat(s).

Meeting my hesitant ‘I am not sure that my body will fit in there’ by decisively kicking down one of the mat walls, the child made possible fat(s) relations of fitting capable of actively reasserting what is entailed in ‘fitting’ and space. As I curled my legs tightly against my chest (a movement made possible by yoga pants), two more children clambered into the space without pausing to wonder the logistical possibilities of fitting. Fitting fat(s) relations of experimentation, of confronting what Springgay (2012) details as the “chaotic and vibratory spaces of activeness” (p. 557) in pedagogies, and of responding to the ongoing politics of fitting as they are made differently palpable became necessary. Fitting relations were profoundly unconcerned with submitting bodies to existing space constraints and, as bodies and fat(s) and muscle(s) overlapped with toppling mat(s), these relations became a practice in reformulating how ‘fitting’ might unfold (Lenz Taguchi et al., 2016; Rautio, 2014). Fitting marks, in this moment, a provocation of making fat(s) with space, of doing bodied displacement as an ongoing, immersive, uncertain negotiation of creating space (Manning, 2009; Pacini-Ketchabaw et al., 2016; Yazbeck & Danis, 2015). These relations of fat(s) fitting ignore pre-existing observations of fitting/space/fat(s); they actively refuse the logics of developmental fat(s).

These fitting fat(s) relations momentarily matter as post-developmental fat(s), where the politics and spaces and ethics of fat(s) are constantly renegotiated such that my worries about my body not fitting into a space (and the developmental fat(s) this made real) literally become unintelligible. When the logics with which I assessed my body would not fit are made

unthinkable (Haraway, 2016), the fat(s) made of these logics become vulnerable to creative interventions and enter differently into conversation with the lively matters of early childhood education. Participating in the ongoing making-perceptible of spacetime configurations (Barad, 2007) demands that I take seriously my active accountability to the continual unfolding of tentative, relational possibilities made real with fitting fat(s). Here, post-developmental fat(s) do (with) fitting as a practice of answerability.

Tending Counting Fat(s)

We often inquired with moving in the morning. This meant that mid-morning snack time became entangled with our inquiry practices, as educators and researchers often paused our work to describe what snack was being offered to children or to confirm that children who had opted to pass on snack were certain in their decision. As children flowed out of the inquiry space to share in snack, as snack-covered sticky fingers moved with movement provocations, and as bodies nourished by freshly filled bellies generated differential momentums in the space, snack time interjections mattered as a mode of making fat(s). Planning, selecting, obtaining, and preparing snack marks a readily accessible method of constructing fat(s), where (healthy) fat(s) are maintained and promoted by providing snacks in accordance with licensing regulations (which, in British Columbia, refer to Canada's Food Guide). These fat(s) are made within a transactional logic, where humans care about and for fat(s) in predictable exchanges: adults create healthy snacks for children so that children develop healthy body weights; experts create healthy snack guidelines for educators so that healthy fat consumption can be promoted; children eat healthy snacks and do not become unhealthy adult citizens.

These modes of making fat(s) can be imbued with an ethical attention toward cultivating healthy bodies, but such a transactional logic of maintaining or promoting fat(s) does not hold up

to the complexities of snack time interjections that matter to our movement inquiry. When I enter my voice into a conversation that I was not previously active in to share snack options with children, this is a mode of being concerned with fat(s). Then, I care differently for fat(s) when I move my body across a room to double check with a child that they are satisfied with their choice to skip snack, because my need to confirm this choice is rooted in the assumption that adults know when children should eat. When children return to the movement inquiry space with blueberry-stained faces, our collective moving conversations must intentionally tend to/with fat(s) with snack time interjections.

Pedagogical Problems with Tending Fat(s)

Snack time interjections become a mode of making fat(s) centered upon caring with fat(s). If fat(s) can be cultivated or sustained through practices that are non-innocent, then fat(s) are made as tend-able. Conversant with pedagogies of care (Hodgins, 2014), fat(s) require tending. Snack time interjections are not only a question of how fat(s) are made in practice, but an attention to how making fat(s) requires ongoing, careful, ethical methods of minding and nurturing fat(s). Crafting snack time interjections as a problem with pedagogies requires thinking fat(s) as lively matters worth tending to, where tending practices mark intentional, ethical interventions. While maintaining or promoting fat(s) might be about demarcating fat(s) available to live by or to think about, caring and tending with fat(s) demands non-universalizable, unsteady processes of inhabiting uneven and difficult “obligations of care” (Haraway, 2008, p. 7). Rautio (2017) elaborates tending and tuning as modes of “understanding or tuning into how something not-self is similar to your self and tending that not-self as part of your self” (p. 97), where questions of how tending unfurls with pedagogies demand an attention to the complex politicization of caring with more-than-human others. Taking inspiration from Rautio, doing

caring fat(s) as problems with pedagogies requires sustained and unfamiliar practices of tending fat(s), such that we might ethically and intentionally tune differently to how fat(s) happen otherwise. Not all practices of making fat(s) are drawn with tending and caring, and not all tending(s) of fat(s) are disruptive or evocative or inevitably post-developmental, but tending is always active and intentional and swathed in response-ability (Haraway, 2016; Hodgins, 2014).

Extending upon the queries snack time interjections effect, how do fat(s) generate problems of tending with pedagogies? How do practices of maintaining fat(s) spin into modes of tending fat(s)? If tending burrows into the demands that caring with fat(s) might make of fat(s) and pedagogies, then it becomes essential that we trace the messy bonds where tending saturates fat(s)-maintaining practices with ethics and intentionality. How can we truly tend with fat(s) with early childhood education pedagogies – and what happens when we do? How might we be accountable to the tending that we enact or obscure and to the fat(s) that we intentionally care with or purposefully refuse?

One mainstream Euro-Western mode of maintaining fat(s) relies on statistical practices of quantifying lived fat as accessible, measurable, stable, and subject to anthropocentric constructions of empirical, scientific numeracy (Bacon & Aphramor, 2011). Presenting fat(s) in statistical terms, where counting becomes a scare tactic for asserting heteronormative conceptions of health, marks one central strategy of the insidiously iterative governmental function of the obesity apparatus: use seemingly objective statistics to purposefully mark some bodies fat, assert evidence-based strategies to mitigate the bodies that were strategically counted as fat, use (re)counting and analytic strategies that ensure the need for counting and for evidence-based interventions, and therefore guarantee that a continual emphasis on governmentally sanctioned notions of health (and citizenship) becomes increasingly urgent (Guthman, 2013). It

is not uncommon for fat-adjacent resources for early childhood educators (including those centered around concepts of obesity, physical activity, or healthy living) to launch from a terrifying statistic about rates of obesity among children, and for these statistics to immediately segue into probabilities for lifespan obesity-caused morbidity and mortality. These statistical habits maintain fat(s) that are overwhelmingly developmental.

Tending fat(s) with statistics in our inquiry. I often notice myself taking fat-adjacent statistics very seriously. I find it difficult to not feel discomforted by statistical predictions that 50% of Canadian provinces will have more adults who are overweight or obese than adults with ‘normal’ weights by 2019 (Twells, Gregory, Reddigan, & Midodzi, 2014). It matters to me that I am so complicit in mainstream fat(s) making practices that I impulsively feel alarmed by this statistic and must intentionally shelf that unsettling tendency before I can wonder the ontological complexities of predicting fat(s). I am incredibly concerned that 23.1% of youth who participated in a national survey reported to Statistics Canada (2014) that they met pre-determined weight and height-based criteria for overweight or obesity. It certainly matters more to me how body mass index standards seamlessly mark these youth as overweight or obese, therefore firmly evaluating their bodied legitimacy, marking them as certain types of citizens, and assigning a moral appraisal to their relationship with their fat(s) (not to mention how uncritically and uncare-fully this statistical figure is tossed around in discussions of obesity) – but, as much as my critical post-developmental, post-qualitative researcher heart might long to pretend otherwise, that 23.1% number does matter to my pedagogical thinking. This imperfect, violent, settler colonial statistic is enmeshed in my tending with fat(s). I am response-able to the Euro-Western machinations that allow for these statistics to prevail in mainstream curriculum resources and I am account-able to how these statistics endure with/in my pedagogical intentions. Borrowing

inspiration from Rautio (2017), to imagine that fat(s) statistics never touch our pedagogical inquiry work with movement would be to obscure that statistics and fat(s) might be tended to otherwise. This would require that I refuse to tune with how statistics might be part of fat(s) and to how fat(s) might tend with statistics. How then, might I tend with fat(s) with statistics as a generative problem with pedagogies?

If tending marks a call to “matter and not just want to matter” (Haraway, 2016, p. 47), perhaps tending with fat(s) with statistics can lean upon deFreitas’ (2016) reimagining of “how we might do calculation differently, how we might distort calculation for new purposes” (p. 462). Infiltrating anthropocentric numerical models of discrete, finite magnitudes of calculation that mainstream Euro-Western mathematics (including inferential statistics) are loyal to, deFreitas works to “rethink the ontology of the data point” (p. 463). Tending to ‘calculating matter’ as a question, wrought with complex ethical tensions of how intensely politicized calculating performances unfold, deFreitas stories how an “iterative but creative calculation [might] be immanent within matter” (p. 468). The ontologically productive numeracies at play in deFreitas’ inquiry, the nuances of which are deeply entangled with thinking fat(s) made in feminist new materialisms (Colls, 2007; Warin, 2015) but stretch beyond the scope of this article, become a mode of tending with fat(s) and statistics: how might pedagogies and practices calculate with fat(s), when calculating is conversant with worlding and numeracy counts into ethico-onto-epistemological liveliness? When numbers are not discrete, fat(s) are multiple, and pedagogies, fat(s), and numbers continually (re)craft numbers, fat(s), and pedagogies, how might statistics become pedagogical provocations?

As I notice, in our pedagogical inquiry work, how fitting fat(s) are made with mat forts, Lather’s (2016b) query of “what would a curriculum look like that focused on situating,

historicizing, and contesting the conventional epistemological and ontological framing of numerical data?" (p. 504) entangles with fat(s) to smash fat(s) + statistics + (early childhood education) pedagogies into conversation. When mat walls are kicked down to remake space – a spatial endeavour that perhaps never was dedicated to rational, anthropocentric assessments of volume, displacement, and parsing space as discrete units – fat(s) are a critical doing with statistics. These fitting fat(s) literally refute the ontological underpinnings of statistical discourses, which rely on specific scientific conceptions of numeracy that allow for precise empirical quantification. The work entailed in trapping these mat-fitting, momentarily post-developmental fat(s) as a positivist statistic is immense, and perhaps, I hope, joyfully impossible.

How can we tend with fat(s) that are incomprehensible to (and far too concerned with other lively features to pause for) a body mass index statistical measure? deFreitas, Dixon-Román, & Lather (2016) compel a rearticulation of how “becoming a statistic” (p. 431) unfolds, and thinking fat(s) and statistics with this renewed attention to statistical making means that the 23.1% statistic about overweight and obese youth in Canada might be crafted otherwise. That these digits might matter for their predictive capacity dissolves into a concern for how fat(s) are made with ontologies that allow for estimating flesh, while also wondering the ontological absurdity of forecasting fat(s) that are profoundly, unpredictably, politically generative. Rather than feeling endlessly frustrated about the governmental techniques of deploying body mass index criteria to understand fat(s), a 23.1% made in alternative ontologies of numerical scale means that I must tend to how this statistic can be, and is, deployed otherwise, therefore tending fat(s) and statistics as modes of worlding amid a “hope that numeracy will never be the same” (Lather, 2016b, p. 504). This involves taking seriously how, when differential conceptions of mathematical calculus cleave open numeracy such that statistics are iterative and inventive,

statistics made in mainstream quantitative analysis practices might become differently pedagogical.

Pedagogical problems of tending with statistics, with pedagogical inquiry work, tune to the complexities of this 23.1%, to chisel into how this statistic is (re)made, and to care for how this 23.1% *matters*; to tend to how this statistic *counts*. This is a refusal to ignore 23.1% as a consequential signification coupled with an equally aggressive push to never tolerate 23.1% as ontologically sustainable; it is understanding 23.1% as developmental fat(s) while interrogating 23.1% with post-developmental fat(s). Taking tending fat(s) as problems with pedagogies, with statistics, creates pedagogical provocations of counting. How do we count with/in/as fat(s)? What, and how, do fat(s) count (in/as)? How does counting (with) fat(s) make possible varied fat(s) relations in early childhood education?

Pedagogical Provocations of Counting Fat(s)

In mainstream obesity-preventing early childhood education resources, fat(s) often count as calories. Fat(s) made as calories are rooted within a transactional logic of calorie balance, and metabolism is crafted as a machine of consumption that can be understood by numerically-bounded constructions of caloric intake and output (Landecker, 2011). As calories that enter into a body are counted, deducted from calories expended by a body, and weighed against expectations for how that body should be gaining, losing, or maintaining mass, fat(s) are made as operationally exchangeable. Epistemologies of closely governed caloric conversion, which rely upon Euro-Western constructions of numeracy and quantification, allow for what Landecker (2013) elaborates as “postindustrial metabolism” (p. 495), whereby neoliberal practices of counting explicitly promote fat(s) relations of regulation. These linear, additive counting practices and the regulatory relations that sustain these practices make fat(s) that are

developmental. These developmental fat(s) perpetuate relations of control, monitoring, and reduction, where pedagogical provocations of counting make visible how fat(s) can be strategically crafted as techniques of bodied governance in service of Euro-Western scientific epistemologies. As educators are reminded that children should only drink 125mL of fruit juice no more than twice a week (Collaborative Action on Childhood Obesity, n.d.) or that “child care programs must ensure a minimum of 60 minutes per day of outdoor active play” (Government of British Columbia, 2016, p. 1), fat(s) are made to count (as) calories which foreground developmental fat(s), which maintain fat(s) relations of mitigation and management.

Counting fat(s) with bike jumps in our inquiry. How can fat(s) count otherwise? Often our pedagogical inquiry work travels into the forest, where children and educators are engaged in complex, enduring, challenging conversations with youth in the neighbourhood who construct bike jumps made of tree branches, couches, rocks, soil, and an array of materials that inhabit the forest. When we visit the bike jumps, children clamber over the hard-packed muddy mounds, stretching their bodies over inclines that reach higher than the heads of educators. A readily accessible logic might think these moving moments as complicit in the required 60 minutes of outdoor play required by provincial licensing or as an antidote against the sugar-rich fruit juice a child might have sipped. This exercise-based frame of reference might enter developmental fat(s) into dialogue with the bike jumps.

The bike jumps, however, make possible fat(s) relations that demand other practices of counting. Recently, the children confronted new bike jumps in the forest. These jumps brought with them a massive hole where soil used to stabilize the jumps had been swiped from. Children were concerned about the hole, and the trees and soil and critters that had been disturbed in making the bike jumps, and wanted to repair the hole as an act of care with/in the forest. With

educators, children strategized an intervention in these new bike jumps, where they deconstructed the bike jump and, with many loads of shoveled and wheel-barrowed soil, filled the massive pit with the bulky materials that had been made to participate in the bike jump. To count this moment only as a developmental fat(s) accomplishment of recommended physical activity duration or as burning excess calories through sustained exercise severely delimits the scope of fat(s) counting made pedagogically perceptible.

Thinking pedagogical provocations of counting (with) fat(s) with bike jumps requires counting practices that are intentionally disloyal to familiar systems of calculating. I can understand the two hours that it took to refill half the hole as a temporal investment in repairing the forest and getting exercise, but this conception foregrounds only how predominant criteria for understanding fat(s) and metabolisms counts this moment. It does not account for how bike jumps, buckets of soil, and tired bicep muscles count differently with fat(s). Borrowing from scholars who complexify how temporalities and pedagogies entangle in complex, dispersed, and fractional ways in early childhood education (Farquhar, 2016; Kummen, 2010; Myers, 2016), just as time is made multiple in diffractive, non-human, or post-developmental practices, so too might counting proliferate with fat(s). I extend Pacini-Ketchabaw and Kummen's (2016) proposition to cultivate "temporalities that do not necessarily view time as a container" (p. 433) into thinking fat(s) that cannot enact counting as confined. That is, when "knots of time bind us together and, in doing so, become relations of obligation" (p. 433), how can counting become a practice of intense accountability, a taking to account with counting that does not allow for bounded, stable, familiar practices of counting fat(s)? When fat-powered muscles strain against shovels loaded with soil and fat-hungry stomachs start to rumble with exhaustion after multiple trips between the bike jump carcass and the replenished hole, fat(s) count with/in/as an

investment, as an ethical commitment to be accountable to the obligations counting engenders. As we care-fully carry soil across the forest floor, fat(s) relations of investing are made possible, where energy and fat(s) and metabolism make calculations of situated response-ability. Rather than accounting for calories burned, counting with fat(s) traces how calories matter momentarily as moving soil, as dismantling holes where tree roots were severed. Where Myers (2016) attends to play as a “temporally productive event in its own right” (p. 428), fat(s) can count with bike jumps, with pedagogies, as a counting that actively refigures what it is to count. Counting fat(s) becomes a transitory practice of accounting with fat(s), of intentionally pouring calories into forest interventions. These fat(s) can be made to matter momentarily as post-developmental fat(s), as fat(s) that refuse to submit to anthropocentric, predictable, sequential modes of counting. These fat(s) are not the fat(s) of statistical scary stories, but are fat(s) fashioned with/in ethical knots with/in complex lifeworlds.

These post-developmental counting fat(s) relations are slippery, as they count and recount and account differently, constantly. Haraway (2016) puts forward Chthulucene time as “an ongoing temporality that resists figuration and dating and demands myriad names” (p. 51). Reading Haraway’s description into problems of tending fat(s) and provocations of counting fat(s), post-developmental fat(s) might also count in multiple methods: how can bike jumps and fat(s) and pedagogies count collectively, unendingly? When post-developmental and developmental fat(s) count otherwise, how can pedagogies take seriously how fat(s) count?

Doing (with) Post-Developmental Fat(s)

Detailing valuating and tending practices of ‘making’ fat(s) as productive problems with pedagogies, and thinking with fitting and counting fat(s) as pedagogical provocations, I have articulated tentative, temporary, and non-universalizable gestures toward how post-

developmental fat(s) might matter with early childhood education pedagogies. Importantly, the momentarily meaningful post-developmental fat(s) elaborated in this article are crafted in precise collisions of making, valuating, tending, relating, fitting, and counting with fat(s). These fat(s) did not simply happen and they are never conclusive; they entangle with yoga pants, mat forts, snack time, statistics, metabolisms, and bike jumps, and with pedagogical worlding in localized, partial engagements with post-developmental theorizing. There is nothing about fat(s) or the moments from our pedagogical inquiry work that are inherently post-developmental or disruptive or pedagogical. Rather, these fat(s) matter as tentatively post-developmental and are infused with intentionality, with pedagogical politics invested in doing (with) fat(s) otherwise.

Post-developmental fat(s) precipitate questions of where, and how, fat(s) happen, momentarily and differently and constantly in early childhood education. Making post-developmental fat(s) perceptible entails doing fat(s) pedagogically, whereby disrupting dominant epistemologies of fat(s) (especially as they become entangled with discourses of health, or obesity, or development) is a practice in making and relating with fat(s), rather than ‘embodying’, understanding, or regulating fat(s). Rather than mattering as a benchmark or ‘best’ way to engage fat(s), I forward post-developmental fat(s) as a verb, as a labour with fat(s), as a practice of actively taking fat(s) as problems with pedagogies and crafting accountable pedagogical provocations with fat(s). Working to make post-developmental fat(s) meaningful is, then, an always ongoing practice of crafting fat(s) as complex and answerable ethical, political, and pedagogical concerns in early childhood education.

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Appendix A: Parents' Information Letter



School of Child & Youth Care
 PO Box 1700 STN CSC
 Victoria BC V8W 2Y2 Canada
 Fax (250) 721-7218
 Web www.cyc.uvic.ca

Undergraduate Program
 On Campus & Distributed Learning
 (250) 721-7979/6278
 Graduate Program
 (250) 472-4857

Parents' Information Letter
Understanding Pedagogical Practices and Research at [Child Care Center]

DATE

To the Parents/Guardians of Children Enrolled at [Child Care Center]:

This letter is a way to introduce you to some of the teaching/pedagogical practices that are happening at [Child Care Center] this year and the research projects that your child's educator/centre, may or may not be involved with. We hope that this letter will help you to understand some of these practices and how they are distinct from any research that your child, their educator, and/or their centre, may be invited to participate in this year.

If your child attended [Child Care Center] during the past five academic years, you might already know about the project that Dr. Veronica Pacini-Ketchabaw started when she and I (Denise) joined [Child Care Center] team in January 2011. Veronica, who has been the principal investigator in this research project since 2011, is currently on leave until July 2017, and I (Denise) am the new principal investigator in her absence. In case I have not had a chance to meet you, or if you have not yet met Narda and Nicole, who have joined the project over the last three years, let us introduce ourselves via this letter.

We work at the School of Child and Youth Care in different capacities.

Denise – I am an Assistant Professor Limited Term in the School of Child and Youth Care and teach courses on child development and in the Early Years Specialization. I am also a Research Associate with the Unit for Early Years Research here at UVic. I have worked with children, families and communities in the human services sector since 1989.

Narda – I am a masters student in the School of Child and Youth Care, where I have been involved in a variety of research project and assistant roles. I joined this project three years ago, and I am very happy to be able to continue supporting the children and educators, and learn with them, through our inquiry projects this year.

Nicole – I am a doctoral student in the School of Child and Youth Care. Currently, I am involved in a variety of projects, including research and instructing roles, in addition to my doctoral work. I began working with children and educators involved in this project three years ago and I am looking forward to continuing our very interesting and inspiring work.

We joined the team at [Child Care Center] in the capacity of pedagogical leaders. We were invited to join the team and collaborate with the early childhood educators in their pedagogical/programming work. Our involvement in [Child Care Center] is part of an effort towards creating further collaborations between academic departments at UVic and [Child Care Center]. Please note that **this work does not involve assessment of the children or the educators at the centre**. Rather our role is to collaborate with the educators on issues of programming and learning.

Last year, we worked with educators and children to think about three different sites of inquiry: movement, creating with tape, and multispecies relations. Through a process of discussion with the educators, we will identify new inquiries for this year, which will begin in different centres and with various groups of children and educators. We anticipate that these inquiries will continually evolve, flow into, and cross over each other as the year progresses.

Many of the educators who work at [Child Care Center], as well as Denise, Narda, and Nicole, are a part of the Common World Childhoods Research Collective. If you'd like to learn more about the collective, and our previous research projects, please visit <http://commonworlds.net>.

Part of our role as pedagogical leaders is to support educators in creating practices that reflect the principles, vision, image of child, and goals outlined in the *BC Early Learning Framework*. The Framework and related documents can be accessed at the Ministry of Education website (http://www.bced.gov.bc.ca/early_learning/pdfs/early_learning_framework.pdf). Since we began working with Child Care Services, many of the educators have begun to engage in a process called pedagogical narrations. The *BC Early Learning Framework* describes this process as the following:

“British Columbia has adopted the term pedagogical narration to refer to a process to make children’s learning visible. Pedagogical narration is the process of observing, recording, and, individually and collectively, interpreting a series of related ordinary moments in [everyday] practice. The process [is] ongoing, cyclical and based on the art of critical reflection on the part of a community of learners [including the educators and researchers]. Pedagogical narration makes children’s learning visible and helps us reflect upon the educator’s practices.” (p. 17)

Educators who engage in this process use observations and note-taking (field notes), photographs and video of children’s engagement in activities, and/or children’s creations (art work, stories, play, etc.) to consider individually, as well as with their colleagues in the centre. It is important to note that, while photographs and video are often a part of this process, children whose parents have requested to [Child Care Center] that photos and videos *not* be taken of their child are not recorded in this way by the educators who practice pedagogical narrations. It is also important to note that we, as researchers and as pedagogical facilitators visiting [Child Care Center], take and store photographs and videos in accordance with [Child Care Center] protocols. Pedagogical narrations are often displayed in the centre and become a starting point in conversations with children, families, and educators.

The practice of documenting children's learning is commonplace in many child care centres in various places, including New Zealand, Australia, Sweden, Italy and cities in North America. Educators who work with pedagogical narrations have commented on its benefits, such as listening more attentively and authentically to the children and families at their centre, their own pedagogical practice, and each other as colleagues.

As part of our involvement in [Child Care Center] aims to develop stronger collaborations between academic departments at UVic and [Child Care Center], other opportunities may present throughout the academic year. These opportunities may include the possibility of participating in research at [Child Care Center]. There are several important points to note about this possibility.

- Every research study that is conducted at [Child Care Center] with UVic faculty and/or graduate students will have to be approved by the Human Research Ethics Board at the University of Victoria.
- Only those who agree to voluntarily participate in a research study will be involved in the research study. All potential participants receive an information letter about the study and an invitation to participate but *only* those who voluntarily sign a consent form agreeing to their participation will be part of a research study.
- If a research project follows the same daily activities of the child care centre, (for example, if a child care centre's programming or teacher's practices are what is being studied) information will only be collected for the purpose of analysis and dissemination from those who have agreed to participate in the study.

Our inquiry work will begin over the next few weeks in your child's centre. Until the beginning of December, our work will involve getting to know you and your child, as we generate initial areas of inquiry in collaboration with educators. We will not collect any information that will be used outside [Child Care Center], including pictures or stories of any children, in this time period. We are hoping that these first weeks of collaborative work can act as an introduction to our practices and research for both you and your child. Between now and December, we hope to meet many parents and discuss our work with you, both informally in the centres, and during pick-up time on a pre-arranged day or a via a scheduled parent information session which will be organized in collaboration with your child's educators.

In December, [Name] the Manager at [Child Care Center], will provide you with a more detailed information package. This will contain an informed consent form, where you will let us know if you do, or do not, consent for your child to participate in our research. Parents may also be asked to voluntarily consent to participate in this research.

You might have other questions for us. Please do ask. We hope to establish and maintain an open dialogue to ensure our collaboration is productive. You can send us an email with your thoughts and/or questions (Denise: [email]; Narda: [email]; Nicole: [email]). If you have questions about the research process you may also want to contact the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

We feel very honoured to collaborate with [Child Care Center] and look forward to our own learning experience.

Sincerely,

B. Denise Hodgins, Narda Nelson, and Nicole Land

Appendix B: Parents' Information Letter and Consent Form



University
of Victoria

School of Child & Youth Care
PO Box 1700 STN CSC
Victoria BC V8W 2Y2 Canada
Fax (250) 721-7218
Web www.cyc.uvic.ca

Undergraduate Program
On Campus & Distributed Learning
(250) 721-7979/6278
Graduate Program
(250) 472-4857

Parents' Information Letter and Consent Form **Pedagogical Explorations at [Child Care Center]**

DATE

To the Parents/Guardians of Children Enrolled at [Child Care Center]:

You and your child are being invited to participate in a study entitled 'Pedagogical Explorations at [Child Care Center]' that is being conducted by Dr. B. Denise Hodgins. Dr. Hodgins is conducting this study with the permission of the manager of [Child Care Center] and the educators in your child's centre.

Dr. Hodgins is an Assistant Professor Limited Term in the School of Child and Youth Care at the University of Victoria and you may contact her if you have further questions by e-mail at [email] or by phone at [number].

Purpose and Objectives

The purpose of this research project is to engage with [Child Care Center] early childhood educators in practitioner action research in order to implement and disseminate pedagogical approaches outlined in a recent document, *BC Early Learning Framework*, published by the Ministry of Education in British Columbia.

Importance of this Research

Research of this type is important because it will provide participating educators and young children with further insights into the practices of the child care centre. The research will also allow [Child Care Center] to position itself as a leader in early childhood education pedagogy in BC and Canada. The work conducted by [Child Care Center] educators will contribute to (a) knowledge-building in the field of early childhood education pedagogy, and (b) improving early childhood education practices for children and families in BC and Canada.

Participants Selection

Your child is being asked to participate in this study because he/she is enrolled in one of the [Child Care Center] Centres and one or more of the educators at your child's centre have agreed to participate in this study.

You, as a parent, are being asked to participate in this study because of the invitation extended to your child.

Description of the Research

The research includes the recording and analysis of the processes involved in ‘pedagogical narrations’ (as explained in the BC Early Learning Framework). The Framework and related documents can be accessed at the Ministry of Education website (http://www.bced.gov.bc.ca/early_learning/pdfs/early_learning_framework.pdf).

“British Columbia has adopted the term pedagogical narration to refer to a process to make children’s learning visible. Pedagogical narration is the process of observing, recording, and, individually and collectively, interpreting a series of related ordinary moments in [everyday] practice. The process [is] ongoing, cyclical and based on the art of critical reflection on the part of a community of learners [including the educators and researchers]. Pedagogical narration makes children’s learning visible and helps us reflect upon the educator’s practices.” (p. 17)

This process will involve recording moments of practice (both by the educators and by the researchers), and engaging in individual and collective discussions with the children and the educators about what takes place in the recorded moments. The purposes of these discussions are to:

- (a) show the learning that takes place in everyday practices in the program;
- (b) deepen and extend the activities observed; and
- (c) follow children’s interests and curiosities.

Ordinary moments of practice as well as later discussions about these moments will be recorded using video, photographs, and field notes. Videos and photographs of your child will be taken only with your permission. All videos and photographs of children participants will be taken and stored in accordance with [Child Care Center] protocols.

The educators in the centre will act as co-researchers in the process of the research.

The educators and the researchers will be involved in an analysis of the moments of practice recorded using the British Columbia *Early Learning Framework* as a guide. Educators may choose to incorporate ideas generated by these analyses into the daily practices for further observation and interpretation.

Some of the information collected and the ongoing analyses might be displayed in the centre and will be communicated to you in regular updates via the centre’s newsletter. This will allow you to be aware of the activities in which your child is participating as well as the learning that takes place in everyday practices at the centre.

Some of the information collected and the ongoing analyses might also be shared through research websites and professional social media accounts (e.g., Twitter). Sharing research knowledge through online platforms will increase the scope of the provincial, national and international audience that our research is shared with. Utilizing professional research blogs and Twitter allows educators and researchers at [Child Care Center] to readily connect and share inquiry analyses in an accessible form with early years educators, students, scholars, and

research institutions and units worldwide. This is vital for the sharing of learning to help build knowledge in the field of early childhood education pedagogy and to improve early childhood education practices for children and families. An example of research websites where ongoing project analyses might be shared is the Common World Childhoods Research Collective at <http://commonworlds.net>. Examples of social media use (i.e., Twitter) with research inquiries can also be found on this site. NO images of children's faces (i.e., images where children are recognizable) will be used online. (Please see the section on Anonymity & Confidentiality beginning on page 4 for more information.)

The collection of observations will begin after [date] and will be ongoing during this academic year.

Your child will participate in the project during his/her regular hours at the child care centre. Pedagogical narrations are part of the regular pedagogical practices of [Child Care Center]. Children and educators participate in pedagogical narrations as part of the regular activities and events of the child care program. This project is distinct from the regular pedagogical activities of the centre in that selected data will be collected from the regular narrations for analysis and dissemination beyond the centre.

If you, as a parent, consent to participate, you will be part of the project during your visits to the child care centre. Often, your child or your child's educator might discuss their experiences during inquiry work with you. You might also be invited to contribute to inquiry work by sharing stories, moments, or materials with your child's centre. Your participation might also involve sharing informal feedback and your experience with, or ideas related to, the inquiry work with researchers and educators.

Inconvenience

The only inconvenience for your child will be the possible interruption that taking photographs and videos will create. Since both photography and video are currently used in the centre by the educators, the main interruption will be the presence of the researcher collecting the observations. It is expected that the children will eventually become familiar with the presence of the researchers and this will stop being intrusive.

There is very little inconvenience anticipated for guardians who consent to participate.

Risks

There are no known or anticipated risks to you or your child by participating in this research.

Benefits

The potential benefits of your child's participation in pedagogical narrations include his/her involvement in his/her own learning processes. You might also benefit as you will be able to participate in discussions regarding the learning processes your child is involved in on an ongoing basis.

Participating in pedagogical narrations will also provide the educators with further insights into this process and their own practice.

By participating in pedagogical narrations as a research study, which will analyze selected data for dissemination beyond [Child Care Center], this research study may generate potential benefits to society, such as the possibility of increased understanding about the processes of pedagogical narrations, and potential benefits to the state of knowledge, such as increased understanding of processes of young children's learning.

Voluntary Participation

It is possible that parents and/or children may feel influenced to participate because of their relationship with the participating educator(s) who are acting as co-researchers in this study. It is very important to stress that your child's participation in this research must be completely voluntary. Your decision to give your child permission to participate or to not give your child permission to participate will not affect your access to childcare services at [Child Care Center], nor your relationship to your child's care providers. There are no consequences that arise from giving or withholding your permission for your child to participate in this study. If you do decide to give permission to your child to participate, you may withdraw your child at any time without any consequences or any explanation.

Similarly, your child's educator(s), who have agreed to participate in this study, have done so voluntarily. They also have the right to decide to withdraw from the study without any explanation or consequences. If all of the educators at your child's centre decide to withdraw their participation from this study, all of the participating children in your child's centre will also be withdrawn from the study. Again, there will be no consequences to this withdrawal and it will not affect your access to child care services.

Your child will also be invited to participate in this research and they have the right to assent or decline their participation. Your child will also be told that they have the right to choose to not participate at any given time. The children will also choose whether or not their photos/work/observations can be used for analysis.

If you or your child decides not to participate, this will not affect your child's ability to participate in the ongoing activities and events of the child care program. Photographs, videos and written records of your child will not be taken for the purpose of this research. Should part of his or her body be in a photo or video, it will be cropped or blurred from the photo or video.

If you do withdraw your child from the study, or they are withdrawn because the educators at his/her centre have withdrawn from the study, his/her data will only be used after you sign an authorization form. However, please note that it will be very difficult for us to remove what your child has said during group discussions. This is due primarily to the fact that after removing one person's dialogue in a discussion, the entire conversation might not make sense. We will minimize your child's data to respect your decision to withdraw him/her while ensuring that we can still gain a good understanding of other children's experiences and insights. When photos/videos are involved, we will crop the photographs and blur the image from the video.

Your decision to consent to your own participation in this research study must also be completely voluntary. All of the considerations discussed above apply to parental participation as well.

On-going Consent

To make sure that you continue to consent for your child to participate in this research, the educators will remind you of your rights to withdraw consent at any time during the process of the research.

Anonymity & Confidentiality

Photographs and/or video recordings of your child will only be taken with your permission. Any photographs and/or video recordings taken will not be revealed in transcripts, reports, or publications that we produce unless we have your permission. Any photographs and/or video recordings to be shared on websites and through professional social media accounts (e.g., Twitter) might have partial images of children (e.g., hands visible, feet visible) but will NOT have images of children that are recognizable (i.e., no faces will be visible).

In terms of protecting your child's anonymity, your child's name will not be revealed in transcripts, reports, or publications that we produce and any information you provide will remain anonymous. We will change such things as your child's name, details about your child and any kind of information that identifies your child. Our research results will not reveal your child's identity or your family.

However, participants involved in the childcare centre your child attends/and those who know your child will be able to recognize him/her in the photographs/video-recordings. We ask all personnel and parents in the child care centre to respect the confidentiality of the child by not revealing the identity or identifying information of other participants with others outside of the centre. We cannot guarantee that all members will keep all the information confidential. In addition, community members may identify your child.

Your child's confidentiality and the confidentiality of the data will be protected by ensuring that no one other than the researchers and educators will have access to the information your child provides. Digital photographs and videos of participating children (i.e., those with permission for photographs and video to be taken) that are taken by the researchers will be securely stored in accordance with [Child Care Center] protocols and UVic University Systems' recommendations. Notes, audio and videotapes will be stored in locked cabinets. Those with access to the data (research assistants) have signed a confidentiality agreement with the principal investigator to ensure your confidentiality.

All anonymity and confidentiality concerns discussed above extend to your parental participation. When data from parental participation is used or disseminated for research purposes, your contributions will not be directly linked to your child.

Dissemination of Results

It is anticipated that the results of this study will be shared with others in the following ways:

- Educators will be invited to disseminate their own work on pedagogical narrations produced in your classroom in articles in professional magazines, and at conference presentations.
- Pedagogical narrations will be displayed both in the centre and outside the centre
- Researchers will use the data in publications and presentations, in line with the Social Sciences and Humanities Research Council's guidelines for effective knowledge mobilization. Researchers may use data results in such media methods as: books, chapters, articles in refereed and professional journals, academic and professional conferences, social media, websites, films and exhibits.
- Research assistants will use the collected data in their masters level or doctoral thesis.

Disposal of Data

Data collected will be stored by means of locked filing cabinet and password protected computer files at the Unit for Early Years Research and Dr. B. Denise Hodgins' office, both at the University of Victoria. Data will be stored for a maximum period of 5 years. All forms of data will be destroyed by April 1, 2020. Electronic data will be deleted, paper copies will be shredded, and audio and video records will be erased.

Contacts

You are encouraged to ask any clarifying questions with regard to your child's participation in this research and I will answer your questions to the best of my knowledge and your satisfaction. My contact information is provided at the beginning of this letter.

In addition, you may verify the ethical approval of this study by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca). As well, you may wish to contact the human research ethics office with any concerns about your and your child's rights and treatment in connection with this research project, particularly if you are not comfortable contacting the educator-researcher or someone else at the centre because of your relationship with them and the sense that you may have of their investment in the research project.

CONSENT FOR YOUR CHILD TO PARTICIPATE

Your signature below indicates that you understand the above conditions of your child's participation in this study and that you have had the opportunity to have your questions answered by the researcher.

Participation *with* Visually Recorded Images/Data

Parent/Guardian to provide initials:

- Photos may be taken of my child for: Analysis _____ Dissemination*

- Videos may be taken of my child for: Analysis _____ Dissemination*

*Even if no names are used, your child may be recognizable if visual images are shown in the results, except for any online sharing, where NO images of children will be recognizable.

Name of Child

Name of Parent/Guardian

Signature

Date

Participation *Without* Visually Recorded Images/Data

Parent/Guardian to provide initials:

- I consent to my child's participation without taking photos of my child _____
- I consent to my child's participation without taking videos of my child _____

Name of Child

Name of Parent/Guardian

Signature

Date

Authorization to use data upon withdrawal from the project

Upon my withdrawal from the research project entitled “Pedagogical Explorations at [Child Care Center]”, I hereby grant Dr. B. Denise Hodgins the right and permission to use my child’s data in articles, book chapters, conference presentations and Doctoral Theses.

Print Name

Signature

Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

CONSENT TO PARTICIPATE AS A PARENT

Your signature below indicates that you understand the above conditions of your participation in this study and that you have had the opportunity to have your questions answered by the researcher.

Participation with Visually Recorded Images/Data

Please initial:

- Photos may be taken of me for: Analysis _____ Dissemination* _____
- Videos may be taken of me for: Analysis _____ Dissemination* _____

*Even if no names are used, you may be recognizable if visual images are shown in the results.

Name of Parent/Guardian

Signature

Date

Participation Without Visually Recorded Images/Data

Please initial:

- I consent to my participation without taking photos of me _____
- I consent to my participation without taking videos of me _____

Name of Parent/Guardian

Signature

Date

Authorization to use data upon withdrawal from the project

Upon my withdrawal from the research project entitled “Pedagogical Explorations at [Child Care Center]”, I hereby grant Dr. B. Denise Hodgins the right and permission to use my data in articles, book chapters, conference presentations and Doctoral Theses.

Print Name

Signature

Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix C: Participant Educator Information Letter and Consent Form



University
of Victoria

School of Child & Youth Care
PO Box 1700 STN CSC
Victoria BC V8W 2Y2 Canada
Fax (250) 721-7218
Web www.cyc.uvic.ca

Undergraduate Program
On Campus & Distributed Learning
(250) 721-7979/6278
Graduate Program
(250) 472-4857

Participant Educator Information Letter and Consent Form **Pedagogical Explorations at [Child Care Center]**

DATE

You are invited to participate in a study entitled ‘Pedagogical Explorations at [Child Care Center]’ that is being conducted by Dr. B. Denise Hodgins.

Dr. Hodgins is an Assistant Professor Limited Term in the School of Child and Youth Care at the University of Victoria and you may contact her if you have further questions by e-mail at dhodgins@uvic.ca or by phone at 250-721-6478.

Purpose and Objectives

The purpose of this research project is to engage with [Child Care Center] early childhood educators in practitioner action research in order to implement and disseminate pedagogical approaches outlined in the BC Early Learning Framework.

Importance of this Research

Research of this type is important because it will provide participating educators and young children with further insights into the practices of the child care centres. The research will also allow [Child Care Center] to position itself as a leader in early childhood education pedagogy in BC and Canada. The work conducted by [Child Care Center] educators will contribute to (a) knowledge building in the field of early childhood education pedagogy, and (b) improving early childhood education practices for children and families in BC and Canada.

Participants Selection

You are being asked to participate in this study because you are an early childhood educator in one of the [Child Care Center] centres.

What is Involved

If you agree to voluntarily participate in this research, your participation will include engagement with the BC Early Learning Framework’s pedagogical approach, namely pedagogical narrations.

“British Columbia has adopted the term pedagogical narration to refer to a process to make children’s learning visible. Pedagogical narration is the process of observing, recording, and, individually and collectively, interpreting a series of related ordinary moments in your practice. The process should be ongoing, cyclical and based on the art

of critical reflection on the part of a community of learners. Pedagogical narration makes children's learning visible and helps us reflect upon the educator's practices." (p. 17)

This process will involve recording of moments of practice (both by yourself and by the researchers), and individual and collective discussions with you (both during activity time and in scheduled meetings) based on the recordings. The purpose of these discussions will be to:

- (a) make visible the learning that takes place in everyday practices in the program;
- (b) deepen and extend the activities observed; and
- (c) follow children's interests and curiosities.

You may choose to incorporate ideas generated by these analyses into your daily practices for further observation and interpretation.

Notes will be taken during/after discussions by the researchers. Some of the scheduled meetings will be video or audio recorded for later revisiting. Ordinary moments will be recorded using video, photographs, and field notes. Videos and photographs will be taken of you only with your permission. All videos and photographs of children participants will be taken and stored in accordance with [Child Care Center] protocols.

You will have access to the data collected from your own program and act as co-researcher in the process of the research.

Some of the information collected and the ongoing analyses might be displayed in [Child Care Center]. You might also choose to communicate the ongoing analyses through regular updates via your centre's newsletter. This will allow parents to be aware of the activities in which their child is participating as well as the learning that takes place in everyday practices at the centre.

Some of the information collected and the ongoing analyses might also be shared through research websites and professional social media accounts (e.g., Twitter). Sharing research knowledge through online platforms will increase the scope of the provincial, national and international audience that our research is shared with. Utilizing professional research blogs and Twitter allows educators and researchers at [Child Care Center] to readily connect and share inquiry analyses in an accessible form with early years educators, students, scholars, and research institutions and units worldwide. This is vital for the sharing of learning to help build knowledge in the field of early childhood education pedagogy and to improve early childhood education practices for children and families. An example of research websites where ongoing project analyses might be shared is the Common World Childhoods Research Collective at <http://commonworlds.net>. Examples of social media use (i.e., Twitter) with research inquiries can also be found on this site. Please note that NO images of children's faces (i.e., images where children are recognizable) will be used online. You might or might not choose to share some of the information collected and ongoing analyses through displaying pedagogical narrations in the classroom, at [Child Care Center] and/or through research websites and professional social media accounts.

The collection of observations will begin after January 1, 2017 and will be ongoing during this academic year.

You will participate in the project during your regular working hours. Some of the discussions will take place during staff meetings. You might or might not choose to dedicate additional time to your own analysis of the pedagogical narrations. If so, you will determine the minimum/maximum amount of time beyond work hours devoted to this project. When scheduled meetings take place outside of working hours, if you choose to attend you will be provided with professional development hours.

Compensation

If you agree to participate in this study, we will issue a certificate of participation for the meetings that take place outside working hours which could be used towards your professional development hours. Please note that this certificate must not be coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation was not offered, then you should decline. If you agree to participate in this study, this form of compensation to you must not be coercive.

Researcher's Relationship with Participants

Beginning in January 2011, I have acted as a pedagogical leader to the educators with [Child Care Center]. My involvement in [Child Care Center] has been to work with the Early Childhood Educators in their pedagogical/programming as part of an effort towards creating further collaborations between academic departments at UVic and [Child Care Center]. This work does not involve assessment of the children or the educators at the centre. In the same way that my ongoing work at the child care centre is not a means to evaluate your practice, this research does not attempt to conduct an evaluation of you or your practice.

Inconvenience

Participation in this study may cause some inconvenience to you. Engaging in discussions related to your pedagogical narrations during staff meetings might detract your team from other issues.

An inconvenience for children and for you might be the interruption or intrusion of being recorded while engaged in daily activities. If this occurs, recording will be stopped.

A potential inconvenience to you if you choose to be part of the project outside working hours is that time will be taken from other non-work related activities of your life.

Risks

There are no known or anticipated risks to you by participating in this research.

Benefits

The potential benefits of your participation in this research include further insights into the process of pedagogical narrations and your own practice. By participating in pedagogical narrations as a research study, which will analyze selected data for dissemination beyond [Child Care Center], this research study may generate potential benefits to society, such as the possibility of increased understanding about the processes of pedagogical narrations, and potential benefits to the state of knowledge, such as increased understanding of processes of young children's learning.

Voluntary Participation

It is possible that you may feel influenced to participate because of [Child Care Center] involvement in bringing me in as a pedagogical leader and their agreement to this research project being conducted at [Child Care Center]. It is important to stress that your participation in this research must be completely voluntary. If you feel influenced to be involved because of this perceived power-over relationship, you should decline participation. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. Your decision to participate or not to participate will not affect your employment in any way.

If you do withdraw from the study your data will only be used after you sign an authorization form. However, please note that it will be very difficult for us to remove what you have said during the group sessions. This is due primarily to the fact that after removing one person's dialogue in a discussion, the entire conversation might not make sense in total. We will minimize your data to respect your decision to withdraw while ensuring that we can still gain a good understanding of other participants' experiences and insights. When photos/videos are involved, we will crop the images and delete clips that involve you.

If you withdraw from the study, you will still receive a certificate for the professional development hours you have completed up to the withdrawal date. If you do withdraw from the study, and no other educators from your centre are participants in this study, the children participants from your centre will also be withdrawn from the study. Their data will only be used after their parents sign an authorization form.

On-going Consent

To make sure that you continue to consent to participate in this research, I will remind you of your rights to withdraw consent at any time during the process of the research every time a new pedagogical narration begins.

Anonymity & Confidentiality

In terms of protecting your anonymity, your name will not be revealed in transcripts, reports, or publications that we produce and any information you provide will remain anonymous. We will change such things as your name, details about you and any kind of information that identifies you. Our research results will not reveal your identity.

You might however want to consent for us to reveal your identity when you are co-authoring articles/chapters/presentations with us. We will ask for your consent every time an opportunity for publication arises.

In addition, given the collaborative nature of this research, you might decide to waive your confidentiality. See below.

Please note that other educators involved in the project will be able to recognize you. We will ask that all participants respect the confidentiality of the group by not revealing participant discussions with others outside of the group, including the identity or identifying information of other participants. We cannot guarantee that all group members will keep everything that is said

in the group confidential. In addition, you will be able to be identified by your own childcare setting community (i.e., colleagues in other centres, families) and potentially by other child care settings in the community (given the size of our community).

Your confidentiality and the confidentiality of the data will be protected by ensuring that no one other than the researchers will have access to the information you provide. Digital photographs and videos of participating educators and children (i.e., those with permission for photographs and video to be taken) that are taken by the researchers will be securely stored in accordance with [Child Care Center] protocols and UVic University Systems' recommendations. Notes, audio and videotapes will be stored in locked cabinets. Those with access to the data (research assistants) have signed a confidentiality agreement with the principal investigator to ensure your confidentiality

Dissemination of Results

It is anticipated that the results of this study will be shared with others in the following ways:

- You will be invited to disseminate your own work on pedagogical narrations produced in your classroom in articles in professional magazines, and at conference presentations.
- Pedagogical narrations will be displayed both in the centre and outside the centre.
- Researchers will use the data in publications and presentations, in line with the Social Sciences and Humanities Research Council's guidelines for effective knowledge mobilization. Researchers may use data results in such media methods as: books, chapters, articles in refereed and professional journals, academic and professional conferences, social media, websites, films and exhibits.
- Research assistants will use the collected data in their doctoral thesis.

Disposal of Data

Data collected will be stored by means of locked filing cabinet and password protected computer files at the Unit for Early Years Research and Dr. B. Denise Hodgins' office, both at the University of Victoria. Data will be stored for a maximum period of 5 years. All forms of data will be destroyed by April 1, 2021. Electronic data will be deleted, paper copied will be shredded and audio and video records will be erased.

Contacts

You are encouraged to ask any clarifying questions with regard to your participation in this research and I will answer your questions to the best of my knowledge and your satisfaction. My contact information is provided at the beginning of this letter.

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca). As well, you may wish to contact the Human Research Ethics Office with any concerns about your rights and treatment in connection with this research project, particularly if you are not comfortable contacting the researcher or the manager of [Child Care Center] because of your relationship with them and the sense that you may have of their investment in the research project.

CONSENT TO PARTICIPATE

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researcher.

Participation *with* Visually Recorded Images/Data

Participant to provide initials:

- Photos may be taken of me for: Analysis _____ Dissemination* _____
- Videos may be taken of me for: Analysis _____ Dissemination* _____

*Even if no names are used, you may be recognizable if visual images are shown in the results.

Participation *Without* Visually Recorded Images/Data

Participant to provide initials:

- I consent to my participation without taking photos of myself _____
- I consent to my participation without taking videos of myself _____

Name of Participant

Signature

Date

WAIVING CONFIDENTIALITY

I agree to be identified by name / credited in the results of the study.

_____ (Participant to provide initials)

Name of Participant

Signature

Date

Authorization to use data upon withdrawal from the project

Upon my withdrawal from the research project entitled “Pedagogical Explorations at [Child Care Center]”, I hereby grant Dr. B. Denise Hodgins the right and permission to use my data in the following ways:

- In articles, book chapters, conference presentations and Doctoral Theses.

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Signature

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A copy of this consent will be left with you, and a copy will be taken by the researcher.