Activity-tracking assemblages in Finnish early childhood education and care

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Abstract
Children's activity-trackers have recently gained popularity to ensure sufficient exercise for children attending Finnish Early Childhood Education and Care settings. Device manufacturers collaborate with public and private providers and supply children with bracelets that measure activity. We interviewed staff who used trackers during 2021, and approach these technologies as assemblages where devices are entangled with discourses, rules and practices. Three events show how assemblages produced children as active/inactive; gaming the algorithm, and educators seeking to use the devices pedagogically.

Keywords
Assemblage, activity-tracking, micro-politics, early childhood education and care, pedagogy

Introduction

A large array of educational technologies, or *ed-tech*, has been developed and mobilized during the last few years. In this article, we take an in-depth look at one field of technology intended for educational use, namely activity-trackers in Early Childhood Education and

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Care (ECEC). We investigate *activity-tracking assemblages* forming around the devices to see what is produced when they become parts of ECEC and present three examples of micro-politics: algorithmic categorizing; children gaming the algorithm, and reorienting the assemblage.

Activity-trackers are part of the "wearable tech" genre which includes various activity-tracking technologies and digital health applications, which have become immensely popular (Bergroth, 2020; Ruckenstein and Schüll, 2017). The central promises of wearable technologies are portability and ease of use. Activity-monitoring technologies are designed to melt into the background, discreetly gathering data on the user's everyday activities and then summarising and filtering it back to the user in an easily digestible format. They can also "nudge" users toward desired behaviors, by reminding them to stand up periodically, for example (Decuypere and Hartong, 2022). Trackers are often attached to the user's wrist, resembling watches or bracelets and typically contain an accelerometer for measuring steps. Some also monitor the location or heart rate of the user. In ECEC, the devices have been marketed to ECEC providers with promises of easily accessible data on children's movement and exercise, and as a motivational tool for physical education (Martin and Hultman, 2022). Several co-operative projects have been started in which technology developers and marketers have targeted private and public ECEC providers. Our data concerns one of these co-operations between a Finnish municipality and an activity-tracker manufacturer.

While activity-tracking technologies are presented as straightforward, simple, and fun additions to ECEC life, their effects are complex and not yet well understood. There is also a relative lack of government policies concerning them. Similarly, there is little guidance on how young people could, or should, use these devices (Goodyear et al., 2019). In Finland, the contacts and co-operative networks between device providers and ECEC vary from one municipality to another (Siippainen, et al., 2023). The complex web of technology acquisition and use has led researchers to ask whether the consequences of ed-tech are those promised (Williamson, 2017). Users may not be familiar with the technology and may not use it in the intended fashion. Alternatively, the technologies may have unintended side-effects that have not been taken into consideration (or at least promoted) by the developers.

In this article, we map the effects that activity-trackers produce, staying attuned to the multitude of actors and interests involved. To do this, we interviewed five ECEC teachers and four carers from eight ECEC centres that used activity-trackers in child groups during spring 2021. In these interviews, we discussed the experience of using activity-trackers and effects of self-tracking technologies in everyday life. This article focuses specifically on three instances where activity-tracking assemblages either produced effects in the life of ECEC groups or where the children and adults sought to "game the algorithm", using the devices to further their own aspirations. We approach these situations with Deleuze and Guattari's (1987) concept of *assemblage.* We take assemblage to mean a web of interacting human and non-human components: activity-tracking assemblages are comprised of the trackers, human bodies, data, figures trackers produce, and discourses such as those related to children's health and the importance of physical activity. Assemblage contains both the idea of heterogeneous components situationally coming

together and changing, and the idea of the productive force of an assemblage (Deleuze and Guattari, 1987). This means that activity-tracking assemblages affect the everyday lives of children and educators but the influence might vary depending on the situational components. We aim to show how the concept of assemblage helps to see how the trackers are affected by and cause affects in their surroundings, dispelling notions of technologies as apolitical or neutral actors. Through this analysis we hope to add to the discussion on the significance and the effects of ed-tech in ECEC.

Measured childhood

Ed-tech has become an important actor in ECEC. One of its central applications has been in producing data for varying purposes of evaluation and assessment where these emerging practices will undoubtedly have a significant influence on the future of ECEC. However, researchers have pointed to several problematic issues. The increasing data-fication of learning (Bradbury, 2019; Roberts-Holmes, 2015) brings dangers of sur-veillance but can also lead to the fact that only things that are easily measurable become significant (Paananen, 2017). That which cannot be quantified as easily (such as equality or justice) can be considered important but still fade in significance as it cannot be tracked as easily. Activity-trackers are one example of the popularity of measuring, as a private Finnish ECEC centre has marketed their use as a way of guaranteeing that children get a certain amount of daily exercise.

Childhood is fertile soil for various measuring and tracking technologies. As societal norms and regulations entangle with responsibility and worry over children and their well-being, technologies can present themselves as offering proof that one has managed to support children in a proper way (Williamson, 2017). With regard to children, adults are faced with questions like how much exercise a child needs; what the recommended amount of screen time is; what kind of nutrition can best support brain development; or how much sleep a child needs. Measuring childhood ostensibly takes place for the good of the other and technologies are applied as means of care. Technology developers have latched on to this premise and are eager to position their products as supporting childcare and education. Children themselves often take easily to technological devices and are open to the activities they suggest (Ruckenstein, 2015). All things considered, it can be argued that measuring aspects of childhood using tracking technologies has slowly established itself as an element of good ECEC and as a sign of caring.

One of the uses of tracking technologies in ECEC is monitoring physical exercise. This relates to an on-going debate on the amount of exercise that is necessary for children. In the field of Physical Education (PE), it has long been debated how much regular exercise a child needs to acquire proper motor skills and physical fitness. Research findings suggest that the habits of physical activity are established at a young age (Telama et al., 2014) and that children in Finland do not get enough exercise. In its 2016 report, the Finnish Ministry of Education (MEC) expressed worry over the fact that only 10–20% of children under the age of seven reached the recommended amount of daily physical activity (MEC, 2016a). As per 2016, this recommendation has been 3 hours of daily physical activity (MEC, 2016a). Hope is placed on technological devices to encourage users to reach this

goal. Especially devices that offer a game-like user experience have been seen as a way of creating more engaging exercise technology (Goad et al., 2019). In other words, digital technologies are rapidly establishing themselves as important parts of physical education. This bodily optimization which entails an understanding of the body based on data, is called bio-pedagogy (Williamson, 2017). In previous research, the increasing use of bio-pedagogies has been seen as problematic with dangers of increased surveillance and enumerating young people's physical activities through constant monitoring (Williamson, 2017). Devices are not working in an unbiased manner and are designed to modify user behaviour: "The software and algorithms that make self-quantification possible are not neutral or objective; rather they are rife with embedded value judgements that reward some activities and not others" (Williamson, 2017: 10). Self-tracking may also change the self-perception of the user in a more permanent way, creating a vocabulary through which to situate bodily sensations into categories and make sense of them, as Bergroth (2020) suggests.

There are several promising ways to problematize human-machine relations. One is approaching the interaction of technological systems and humans through the metaphor of gaming. The notion of *gaming the algorithm* refers to user attempts at operating technological systems in ways that are not intended but advantageous for the users. Researchers also emphasize that algorithms are used in ways that are external to the algorithms (Kitchin, 2017). In other words, systems operate as assemblages that are made of heterogenous parts. The spaces in which humans and algorithms meet are often contentious and not always dominated by the algorithms. Users may have very particular uses in mind for the technologies they encounter (Kitchin, 2017). We argue that the concept of assemblage helps us to understand human-technology relations. In the following, we discuss the concept in more detail.

Activity-tracking technologies as assemblages

In ECEC, activity-tracking technologies operate in constant contact with other elements. This opens the possibility of investigating how they fold onto discourses, practices, and lifeworlds. We therefore approach activity-tracking technologies as assemblages. Our aim is to see, firstly, which elements assemble around the activity-trackers, and secondly, what the emerging activity-tracking assemblages produce.

Gilles Deleuze and Felix Guattari's concept of *assemblage* (fr. *agencement*) has been widely used in critical scholarship (Buchanan, 2015; Paananen and Grieshaber, 2022; Thompson et al., 2022). For Deleuze and Guattari, an assemblage means a compilation of elements that together have productive force. An example of an assemblage could be a compilation of heterogeneous components assembled around a smartphone. As Paakkari (2020) showed, when a smartphone becomes attached to other components – such as human actors, including students in the classroom, teachers, curriculum, commercial actors (e.g. Google, Microsoft) via applications, and the current capitalist economy – it produces students as a workforce for digital labour in classrooms. Students take part in the production of data that can be monetized by private companies when using their mobile devices in class, working on assignments and searching for information on the Internet

([Paakkari and Rautio, 2019](#)). The concept of assemblage has proved a particularly useful tool for analysing complex and entangled phenomena where several factors affect each other, and straightforward causal relations lose their explanatory power. This relates to the fluxing nature of assemblages. Fluxing means that an assemblage changes as different components become attached to it or detached from it ([Deleuze and Guattari, 1987](#)). Therefore, an assemblage is unstable. The internal relations between its components are in constant motion, and the assemblage changes situationally.

[Paananen and Grieshaber (2022)](#) use the concept of assemblage to analyse the effects of policy on the level of the everyday lives of preschools. While looking at how tools of governance are mobilized, they show how a mobile application used to monitor the arrival and departure of children became entangled with the relationships between the educators and the children. In their recent article, [Thompson et al., 2022](#) critique static interpretations of assemblages that do not pay enough attention to the productive power of assemblages. As [Buchanan (2015)](#) points out, for Deleuze and Guattari an assemblage is not a random collection of elements that have ended up together: it is directed towards a goal and aims to produce something. It is purposeful. Deleuze and Guattari emphasize the ways desire operates in assemblages and how assemblages manage to hold together despite forces that are constantly trying to dissolve and change them ([Thompson et al., 2022](#)). In other words, we should not consider assemblages as static structures that produce outcomes in a mechanistic way. What is most important is not what the assemblage consists of but what it can do, what it produces. This can serve as a useful starting point for interrupting the techno-deterministic discourse that is eager to both propose technological solutions to societal issues and to over-emphasize the effects of individual technologies ([Selwyn, 2016](#); [Paakkari, 2020](#)). For us, an assemblage approach has also given an opportunity to expand a systemic approach to ECEC. It has enabled us to investigate how elements "inside" and "outside" a system – in this case the curriculum, regulations, official documents, technological devices and so on – come together and produce effects.

Micro-politics of activity-trackers

As the use of activity trackers unfolds in assemblages, they become sites of disagreements, negotiations and political struggles. In order to shift the ground of political discussions, [Guattari (2007)](#) developed the concept of *micro-politics* to signify that everyday actions have the potential to influence larger societal changes. This helped to challenge the prevailing conception of politics as only taking place in formal institutions. What Guattari claimed was that we cannot know in advance where politics are situated, or what may become a site of political struggle. Here, we take Guattari's concept of micro-politics and use it to analyse the ways in which activity-tracking assemblages drag power relations and economies with them into ECEC. As new elements join the assemblage, power relations shift and new things become politicised. We look at how children and adults engage in micro-politics to reconfigure and bend assemblages towards their desires – in this case, how they game the algorithm. We also suggest that micro-politics

should not be considered just a human affair. As we show later, devices and technologies participate in assemblages, and they also create micro-political events.

Data and methods

The data consists of interviews and documents and was produced during 2021. We interviewed nine ECEC educators (5 teachers and 4 carers) who worked in groups that participated in a Finnish municipality's activity-tracker project in 2021. They worked with children aged 3–6 years. The interviews were conducted individually except for one in which both the teacher and the carer were present. Interviews were conducted at a distance by phone or video call. They were recorded and transcribed. The length of the interviews varied between 30-60 min. In the interviews, the background of the tracker project and the history of the group's involvement in it were discussed. Participants were also asked to describe their uses of the trackers using concrete examples.

The data was analyzed with inspiration from the idea of plugging in (Jackson and Mazzei, 2013). The theoretical concept of the assemblage guided the research process from the beginning. As the concept of assemblage directed our focus on the relations between heterogeneous entities such as humans, technological devices, or documents, we started by selecting excerpts where the interviewees spoke about activity-trackers in relation to other actors. These excerpts included descriptions of how activity-trackers were used by children and adults, and justifying the use of trackers by referring to official documents. The other key element of assemblages is their generative force. As were interested in the generative force of activity-tracking assemblages, we asked the interview transcripts what different components were brought into the assemblages when inter-viewees described the actions taken based on tracker data. This helped in mapping the components of activity-tracking assemblages and seeing the elements involved in the events where the consequences of the trackers were discussed. In doing this, the in-terlinkages between devices, pedagogic documents, and government strategies became visible. The main components of activity-tracking assemblages are presented next. We then discuss three events that illustrate two important points: (1) data generated with digital technology produces a micro-politics of categorization that may marginalize certain children, (2) there is leeway for micro-politics for both children and adults to resist these marginalizing categorizations.

Varying components of activity-tracking assemblages

The investigated activity-tracker consists of three main components. The trackers are round disc-shaped objects that can either be attached to a wristband or carried in a pocket. They contain sensors recording the intensity of movement, its duration, number of steps, and the distance travelled. In our research, the trackers became assembled with human bodies as most children wore the trackers on their wrists during the days they attended. In the four pre-school groups the bracelets were worn from 9am to 1pm and in the other groups they were typically used for the whole day, from 9am until 4pm. Children stored the bracelets in their personal baskets in the lobby and put them on in the morning when

they arrived. The relationship among these component parts, trackers, and children's bodies varied. The staff said that children, younger ones especially, sometimes found the bracelet too big and uncomfortable. Other component parts became attached depending on the time of the year. The device was difficult to put on with winter clothes and overalls.

The second main component of the activity-tracking assemblage was an application that was used by the educators to monitor children's activity levels. It was installed on a staff tablet and information from the bracelets was synchronized with the tablet application by bringing the tracker close to the tablet. Some of the groups did this every day, some once a week. Once the data was transmitted to the application, movement statistic summaries became visible on the tablet. There were several views available: one showing the movement stats of individual children, another showing a group-level summary, and a map showing distances to various places. The group could choose a common destination and see how many steps they collectively needed to reach their it. Children could also use the application at home together with adults. As is typical with child-oriented technologies, a strong emphasis of gamification was evident (Lyall, 2021). In the application, users collected points from their movement which would then give them credits for playing an in-app game. In many cases, a categorization provided by the application became an important part of the activity-tracking assemblage. Movement was categorized according to three levels of intensity, which were identified using animals (cheetah, rabbit, tortoise) and corresponding different colours (green, orange, red).

The third main component of the activity-tracking assemblage were national and local policies related to physical activity and especially the national recommendations of 3 hours of daily high-intensity exercise for children (MEC, 2016a). While the scientific justifications for the recommendations point out that "the optimal amount of physical activity or passivity for supporting a wholesome development cannot be stated accurately in light of current research" (MEC, 2016b: 17), the recommendation for 3 hours daily of high-intensity exercise has established itself as a common goal in Finnish ECEC.

In the next sections, we address the productive force of situationally varying activity-tracking assemblages that we call the micro-politics of activity-trackers. We focus on three distinct examples. Firstly, we discuss the *micro-politics of algorithmic categorizing*: the ways in which children become categorised as active or inactive in activity-tracking assemblages. The categorizations are produced by tracker algorithms coding the children as "active" or "passive", as rabbits or tortoises. They also lead to the on-going discussion about necessary amounts of daily physical activity for children. Secondly, we look at the *micro-politics of gaming the algorithm* where children actively take part in the activity-tracking assemblages and seek to "game the algorithm" as they face the consequences of the categorizations and are encouraged to be more active. Thirdly, we look at the *micro-politics of reorienting the assemblage*, investigating how educators use the technologies for their own purposes and expand the activity-tracking assemblage in unforeseen directions.

Active and passive algorithmic children

In its most stripped-down form, the activity-tracking assemblage consists of wrist-worn trackers and the software used to view statistics on a tablet. However, the tracker is also entangled with PE movement goals for children, the general guidelines for children's activity, and the public debates surrounding these. Likewise, it has a connection with the physical faculties the groups have at their disposal and, by extension, the economic resources of the municipality. The national recommendations for physical exercise guide the categorization of children as active or inactive, and the physical activeness of a child is something the educators are guided to focus on (MEC, 2016a).

The basic function of the trackers was to collect and algorithmically sort sensory data on user movement. Users could survey the data from the interface both on individual and group-level. While the interviewees did not follow the data in real-time, the statistics seemed to create a categorization where some children were seen as being "in the green" and others not. The children who had gathered fewer steps in the application were encouraged to move to get better scores.

In the interviews, adults routinely categorized children along the lines of their physical activity. One of the basic distinctions was whether a child was physically active or not. The following interview excerpt is used as a prompt to discuss the variations of children's movement.

> That child really has 3000 steps more than the neighbor. And mind you, this other child is also an active mover, not one of these daydreamers and lingerers but instead active and wants to be on the green, and often is. (Interview 8)

In this excerpt, a dichotomous categorization emerges, positioning "active movers" on the one side and "daydreamers" and "lingerers" as the opposite. The children are produced as active or inactive, some running around and others preferring to stay still. While this categorization is certainly not new, the trackers seemed to give it added reinforcement. In what we call *the micro-politics of categorization*, the statistics provided by the tracker focused the teacher's attention on a quantitatively constructed expression of movement. While physical activity can be seen in many ways, tracker data guides the observer towards focusing on the numbers. Physical activity became reduced to the number of steps taken. Furthermore, the way the tracker data was visualized also contributed to the impression of its validity. This becomes apparent in the next excerpt where the interviewee discusses surprising insights brought on by the trackers.

> Interviewee: Well with some children it's been like they move more than we have thought, or that someone is not as active as we have thought. With some children we've been surprised about it when comparing with others.
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> Researcher: Why do you think this is?
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> Interviewee: Well, I don't really know. It's been especially surprising in the way that someone we don't think moves all that much seems to actually move a lot. But maybe they have a

movement or a gesture they keep repeating [laughs], so maybe it's something like that, the tracker registers every movement or something.

Researcher: Have you found the tracker info reliable?

Interviewee: Well, it is pretty reliable because you can see the diagrams and the bars. (Interview 3)

The data from the tracker and the professional experience of the educator could sometimes be at a disagreement. The application could show a better-than-expected score for a child or inversely could present a seemingly active child as inactive. Some said the situations were "eye-opening" as they realized they had not properly understood how little or how much the children moved. We see two interesting analytical directions in this observation. Firstly, the techniques the device uses for producing the image of objective assessment of movement. In the excerpt, the interviewee refers to "the diagrams and the bars" that the user sees. These are illustrations the application uses to turn the accelerometer data into a graphical-numerical presentation. Seeing a distinct number and a graph can be enough to convince users that their own experience of the child is less reliable than the interpretation offered by the device. Secondly, we also see how some uncertainty remains over how accurate the stats really are. This is evidenced by the suspicion that the child may perhaps be waving a hand or repeating a gesture that the tracker mistakenly interprets and increases their activity score.

As the children became classified as active or inactive, the teachers started encouraging them to move to gain better scores on the application. In the next excerpt, the interviewee talks about how teachers used the tracker data.

It may be a little easier to motivate someone to run or something like that. Like, don't just sit around all day during outdoor time on the yard. Run a few times so that you can also collect your points. (Interview 4)

While encouraging children to move is a common practice in ECEC, in this excerpt the exercise is explicitly motivated through collecting points. This shows how physical activity becomes linked in the activity-tracking assemblage and begins to be framed through it. We can see how the micro-politics of categorization operates by translating physical movement into a numerical measurement that is then categorized in the application. The assemblage produces a categorization that has the power to change how the adults see the children. This in turn leads to the children being instructed to move more to get better scores in the application.

Children gaming the algorithm

Next, we look at how children advance what we call *a micro-politics of gaming the algorithm* in response to the categorizations emerging in the assemblage. As the trackers marked the children as active or inactive, they developed strategies to be seen favorably by the adults. In the following, while discussing how children reacted to the trackers, an

interviewee speaks of a group of children who were not particularly inactive and had the habit of standing around talking. Once the children noticed that they were not "in the green" on the application, they started walking around the yard during meetings.

> There were those who participated in PE but during recesses would rather just lean and stand around. But they then had a realization and started moving more, and could have their own meetings and discussions while walking. So they would no longer stand still while talking. In that way it really encouraged them to move. (Interview 7)

The interviewee presents the event as an example of the tracker encouraging the children to move. In addition to this it is instructive to consider that while it is true that the children started moving in response to the tracker data, the initial purpose of the trackers was to increase their high-intensity exercise. The lack of children's high-intensity exercise was one, and possibly the most important, of the central findings in the Ministry's guidelines on children's physical activity (MEC 2016a). The trackers were brought in as a potential way of solving the issue but here it seems their effect is something else. The gamified nature of the application leads to children aiming for a good score in the application – not necessarily an increased amount of high-intensity exercise.

While the idea of children having "walk-with-me" meetings seems surprising, in terms of the assemblage it is perfectly rational. In the micro-politics of categorization, the initial goal of having more high-intensity exercise has been algorithmically translated to three differently colored activity bars. While many expressed doubts about the graphs' capability to capture and represent movement accurately, these were the only categories available and users mostly abided by them. In any case, after the activity goals had been translated to graphs, being "on the green" became the shared everyday goal. The children in the excerpt cleverly pick this up and notice that walking around during meetings helps them to achieve the score. At this stage, it is obvious that *the original goal of getting more high-intensity movement has been lost and turned instead to the goal of having a green graph*. Therefore, both the children and the adults perceive themselves as succeeding in the task. The fact that the original goal has been lost in the process is no longer remembered. This is what we call the micro-politics of gaming the algorithm. In response to the categorizations and the fact that adults start encouraging them to move, thus exerting more control on the children's movement, the children find a way to game the algorithm that produces the desired effect of having a good score in the application.

A somewhat paradoxical shift in the goal of physical exercise can also be observed in the following excerpt.

> That's how we ended up cheering together and encouraging others, and then it became less important what the actual reading was each day. What was most important was that everybody could make it to the green. And the last two months we had the whole group on the green each day. Even those who would rather just build things and think about stuff and consider things. They also found a way to move…that the activity tracker could measure. (Interview 8)

Here, the interviewee describes how everyone in the group was encouraged to move with the explicit goal of getting the collective score to the green. This becomes most apparent with the children who would "rather just build things and think about stuff" and who therefore could not really be considered inactive. In the context of the activity-tracking assemblage, their activity was the wrong kind since it did not register on the trackers. They were therefore encouraged to modify their activity and later succeeded in moving in a way the tracker could measure. Here again there is evidence of moving further from the initial goal of increased high-intensity exercise: what the teacher suggests is instead *modifying the activities in ways that make them visible to the tracker*. In other words, we see how the children and the adults together are gaming the algorithm.

Reorienting the assemblage

While the assemblage was powerful in producing categorizations regarding the activity and inactivity of the children, in some cases it could also be directed towards other ends. In the following, one teacher describes using the tracker data to further their under-standing of a child.

> In one case I actually even understood the child better when I noticed that they really do move all the time, and it has got me paying attention to the fact that this child really is in constant movement. They can also concentrate on things but their general way of being is hopping or doing extra rounds instead of walking, and then the tracker showed that yes, this really is a very energetic child.
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> […]
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> With this child that I realized how much they really moved, but there was also a little bit of an hyperactivity consideration going on. However, observing them with the tracker I noticed that they really are constantly on the move but...there are also long moments when they can concentrate on doing a single thing. That relieved me in a sense because we were wondering what it was about. It is hard to explain but this kind of gave us new lenses, showing that movement is just a part of their character. (Interview 2)

The teacher describes having diagnostic concerns about a child, potentially thinking they might have to initiate a diagnostic process for hyperactivity. Using the tracker gives a new perspective into the child's activities. This helps to reorient the tracker data, turning it into a tool for seeing the child in a different way and easing the worry over possible hyperactivity. This is what we call *the micro-politics of reorienting the assemblage* because of the power of the tracker to influence a pedagogical decision.

The teacher explains how important it is that the tracker confirms her observation of the child moving extensively, but also gives provides evidence of long spells of concen-tration. The existence of both these elements in the data is what alleviates the teacher's concerns. In the process, the teacher connects new elements into the assemblage, such as pedagogical goals and possible diagnostic criteria. The ICD-11 (F90.0) criteria for hy-peractivity include "excessive motor activity", "often running about" and "feelings of

physical restlessness" but importantly also "the difficulty of engaging in activities quietly"[1] (World Health Organisation WHO, 2018). The fact that the tracker shows long spells of concentration suggests that the diagnostic criteria of the difficulty of engaging in things quietly are not filled.

This gives us a chance to consider the epistemic implications of the tracking technologies. In this case, the teacher's own observations are extended but also questioned by the device. This then serves as a tool for seeing the child in a different way and easing potential diagnostic concerns. The device operates as an 'epistemic crutch' that provides concrete evidence that the child really is very active but perhaps not in need of diagnostic interference. For us, this highlights the fact that the emerging epistemic agency is not one-way and not only a dilution of authentic human experience. Users recognize the different epistemic possibilities inherent in the data and use them tactically depending on the evidence they need. Once the data produced by the device exists, it can also be used to support varying intentions.

Discussion

As Thompson et al., 2022 write, it is important to focus on the productive aspects of assemblages. Along with an in-depth look at what these activity-tracking assemblages produce, we used the concept of micro-politics as a way of bringing forth the re-negotiations constantly taking place around assemblages. Our analysis focused on three cases where adults and children used different means to re-orient an assemblage. For Guattari (2007), micro-politics was a way of critiquing the conceptions of politics that situate political activity and political events solely at the level of major institutions. In line with a feminist emphasis on personal as political, Guattari underlines that we do not know what is political, or where politics is situated, in advance. Everyday lives are always already political and waiting to be politicized in new ways. Approaching activity-tracking technologies as assemblages has helped us to analyze how they connect with other components in the assemblage and produce situationally varying effects. With the concept of micro-politics we want to underline the implications of these effects and show that they can have wide-ranging consequences for children, staff and pedagogies. Bringing the concepts of assemblage and micro-politics together helped to see that a particular technology may produce a multitude of effects. In some cases, the devices potentially increase competition between children and can even be seen as participating in the production of competitive self-surveillant subjectivities. On the one hand, this may produce marginalizing categories but on the other, in some circumstances, may afford children and adults spaces for micro-political interventions.

In the activity-tracking assemblage this article has investigated, technologies offer a possibility to render parts of childhood measurable. They produce quantifiable data of child activity which, when brought together with increasing concern over the physical fitness of children, is seen as a way of guaranteeing sufficient physical activity for children. Once the official recommendations for physical activity in ECEC introduce a specific three-hour daily target time (MEC, 2016a), the stage is set for measurement technologies that can verify if the required time has been reached. The assemblage also

has its financial connections: the funding for the trackers comes from a municipal digitalisation initiative. Later the funding is transferred to the ECEC administration (Siippainen et al., 2023). In participating child groups, the devices become a part of daily life, potentially entrenching technology as a necessary and normal component of public education.

Gamification has been suggested as a way to engage children (Goad et al., 2019; Hamari et al., 2014). In this assemblage the gamified nature of the tracker is both what makes the device so popular but also what leads to it presenting data inaccurately. While the categorizations offered by the tracker and its accompanying application present data in an easily understandable format and categorize child activity with animal symbols, these classifications do not always correspond with the actual amount or intensity of said activity. However, once the activity-tracking assemblage is operational, this becomes less significant. The staff express doubts about the validity of the results but are reasonably content to use the devices regardless. The goal of 3 hours of high-intensity exercise is lost in the assemblage. In the child groups, it is translated to a general aim of 3 hours of any registered activity – or sometimes just a good score in the application.

The assemblage is porous and flexible, and the users take advantage of this. Against the micro-politics of child categorization that the trackers introduce, children take a micro-political stance of gaming the algorithm. By carrying on with their customary activities in a modified way they find means to please the teachers and gain a good score in the application while still doing largely what they did before. The teachers use micro-politics of reconfiguring the assemblage to use the tracker data for other means. This gives one teacher a chance to ease diagnostic concerns over a potential case of hyperactivity.

Conclusion

This article has approached activity-tracking technologies as assemblages in which the devices are entangled with discourses, rules, and practices of ECEC. The analysis considered three events and asked what these activity-tracking assemblages produce. We suggested that what emerged is, firstly, the production of children as active and inactive; secondly, children gaming the algorithm in response to categorizations; and thirdly, educators seeking to use the devices for pedagogical purposes even if the technologies do not work as promised.

One significant product of the assemblage is the way in which it guides the users to interpret their own experiences with the help of the data and translate them through technologies. The idea of *broken data* (Pink et al., 2018), of the data not correctly representing the world as we see it, has been a common experience within self-tracking communities. Technologies have changed and evolved rapidly, and the accuracy, or inaccuracy, of the data has been dependent on where the sensors are placed on the body. On the one hand, the data tempts us with its perceived objectivity, and on the other, we grow frustrated with its deficiencies. Tension between the quasi-objective data provided by the device and the "gut feeling" of the user is characteristic of self-tracking technologies (Bergroth, 2020). Perhaps even more intriguing is what follows from the users trusting the device over their own experience. In the activity-tracking assemblages

observed here, we can see the epistemic power of the technology. In many cases, educators are not trusting their own perceptions and observations because they conflict with the tracker data. At the same time, the trackers are also seen as unreliable. This leaves the staff in middle ground, doubting themselves because of the technology but also doubting the technology.

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Note

1. https://www.uptodate.com/contents/image?imageKey=PEDS%2F53723

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