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Busy doing nothing? What do players do in idle games?

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Abstract

Idle games – games where waiting for extended periods is an important dynamic – are increasing in popularity. The game *Neko Atsume*, a mobile game about collecting cats, is an extreme example of this genre where progress can only be achieved when the game is switched off (so-called "progress while gone"). Do such waiting games engage players? To answer this, we conducted a large survey (N=1972) to understand what players are doing when they play *Neko Atsume*. Players are highly "engaged" in *Neko Atsume* as they interact with and around the game in four distinct ways: *Time spent playing*, *Direct sociability*; *Social media sociability* and *Checking frequency*. However, these characteristics of engagement in *Neko Atsume* do not fit well with existing models of engagement. We propose that, in future studies, game engagement in idle games could be considered as a habit which players acquire and maintain.

Keywords: Idle game, Waiting, Engagement, Player experience, Social

1. Introduction

The mobile phone game *Neko Atsume* [1] has been downloaded over 10 million times [1]. When you start to play *Neko Atsume*, you take ownership of a virtual yard which you can fill with cat toys: scratching posts, cat beds, toy mice on strings, and tiramisu-themed sleeping cubes — all to attract cats to your yard. Soon exhausting all the possibilities for interaction that the game provides, you close the game and do something else. But the game continues even when it is closed, and if you're like millions of other players, you'll still be checking the game several times a day for months to come.

Neko Atsume is a particularly clear example of "idling", a game dynamic which we will approximately define as *time spent away from a game while progress is made*. Idling is characteristic of idle games, and can be found in incremental games such as *A Dark Room* [2] and social network games such as *Hay Day* [3]. In some cases, the game must still be running for progress to be made, even if it requires no direct interaction in this time ("progress while on"). Where progress occurs even when the game itself is closed, this idling dynamic has also been called "progress while gone" [4].

Our understanding of engagement in games struggles to account for idling dynamics. This is in part because of the basis of a lot of empirical studies that study player experience. In all domains of game experience, including engagement, the "prototypical" digital game is an action game. Mekler et al. [5] performed a systematic review of quantitative studies on enjoyment in digital games. Of 87 studies, almost all of them were action games; the majority were first-person shooters, racing games or sports games. Even those studies which looked at more casual puzzle games, such as [6] and [7] considered only the experience of playing the game during a single session.

The prototypical game for player experience research, therefore, is played in relatively long, highly interactive and even intense sessions. The decision when to play the game is not itself a game dynamic. And crucially, the game state doesn't change while the player is not present.

Neko Atsume violates all of these assumptions. 1) It is played in very short sessions, 2) it affects the decision of when to play the game through its idling dynamics, and 3) it incorporates "progress while gone". Idle games are

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not the only ones to violate these assumptions: virtual worlds persist and change between play sessions. However, couple the above with minimal traditional gameplay, and we have to ask the question: does this game actually engage players?

We cannot adequately describe engagement in *Neko Atsume* at the level of the individual game session. Each game session is short, often a matter of seconds (rather than minutes or hours). This suggests that considering a player's engagement as immersion [8] or flow [9] would be misleading. Similarly, following the Process Model of engagement [10] in considering engagement as the period of time bounded by an initial point of engagement and ending with disengagement cannot capture overall time played, frequency of play, and other behaviours that seem to be much more relevant to describing engagement in this game.

After all, there is so little to do when you are actively interacting with the game that you could make the claim (as some have [11]) that you are not playing a game even then. We will set aside the issue of whether *Neko Atsume* counts as a game and our preconceptions regarding what a game is and try to see what it is that players are doing with *Neko Atsume*. It seems that idling dynamics form a major part of this experience. This suggests that understanding engagement in this context requires a broader perspective of what players do both in and around the game over time.

Our initial research questions are "What activities do players of *Neko Atsume* perform?", "How engaged are they in the game?" and "What factors drive that engagement?"

To understand what this broader, longitudinal engagement is, we investigated the behaviours of players of *Neko Atsume* associated with all of the (limited) interactions made possible by the game. This includes checking the status of cats and toys as well as interacting socially by various means such as social media, email/IM and in-person. We then used a factor analysis on these behaviours to identify the key factors of activities in and around this type of game and how they relate to each other. The resulting model of activities is indicative of substantial engagement and that both face-to-face and online social interaction are key features, and these are not correlated with in-game achievements or how frequently players checked the game. However, this model does not fit with the typical activities indicative of existing models of player engagement.

2. Background

As the name 'idle' suggests, the defining feature of an idle game is that most of the time players have nothing to do [12]. Eyles and Eglin [13] describe a similar type of game which they call "ambient games". These games develop the minimal interaction present in idle games by being controlled by a player's real-world actions. Keogh and Richardson [14] also describe games with a minimum of player input, and call them "background games" as they can be played in the background whilst performing other tasks. They are both 'background' in the sense that they run in the background, and also that they are ever-present in the background of players' minds, even when they are not playing the game. However, neither of these accounts fully address the range of idleness that is encompassed in the term. Here, we first consider the development of idle games as a definable genre before looking at the components of idle games that constitute the player experience. The review concludes by looking at how models of engagement may account for how players might engage with idle games.

2.1. History of Idle Games

Games that are primarily 'played' through idling are not new. In the 1990s, there was a worldwide craze for *Tamagotchi* [15]— key-chain-size digital pets that you feed regularly to keep alive [16]. However, idle games of the sort meant here began to emerge in the early 2000s.

Idle games were initially created as parodies [17]. In 2002, Eric Fredricksen created the game *Progress Quest* [18], which parodied the endless reward cycles that have been criticised in MMORPGs (Massive Multiplayer Online Role-Playing Games) [19, 20]. It was comprised solely of progress bars and achievements. In *Progress Quest* all you can do is watch quests happen while progress bars increase and achievements happen with no player input. Other similar games such as *Progress Wars* (in which idling is replaced by clicking) and *Godville* [21] (which describes itself as "a parody on everything from 'typical' MMO (Massive Multiplayer Online) games") explore this further. The game *Cow Clicker* [22] – in which one can click a cow once every six hours – was a parody of social network games [23, 24] . The defining feature of social network games is that they integrate into social networking platforms such as Facebook [25]. Due to similar uses of waiting mechanics, there are similarities between social network games and

idle games made explicit by Bogost [24] through four features that he identified in them: the reduction of friends to resources in the form of enframing [26], their compulsive design, the triviality (and skipability) of the game-play, and the way they encroach into time away from the game.

Idle games have been considered as 'hypothetical games' [27]: games that are not meant to be seriously played but rather considered in the abstract, or appreciated for their parody of another game. Idle games have challenged assumptions about what it means to be a game both in the academic literature [17, 11, 14] and in the popular press [28, 29]. They challenge the popular aesthetic that games should be about overcoming challenges and achieving goals [30]. And despite appearing like casual games, they are still predominantly played by 'gamers' [31]. The most significant contributor to this challenge is the significant popularity some idle games have acquired. Far from being merely 'hypothetical', idle games are played by millions of people [4]. While Bogost's *Cow Clicker* was intended as satire, it became a popular game [23].

Following the successes of early idle games (e.g. [32]), a wave of new, polished idle games such as *Clicker Heroes* [33] and *AdVenture Capitalist* [34] emerged [17]. These games incorporated fremium business models. In this they begin to resemble social network games such as *Farmville* [35] and *Mafia Wars* [36] where fremium business models and the collection and trade in virtual goods are common [25], though it should be noted that some players are rejecting social network games as "time sinks".

While not approaching the scale of social network games, many idle games have become surprisingly successful. Idle games are the most successful games for monetising their players on Kongregate[1], a popular online gaming platform, generally having an average return per user (ARPU) greater than most single-player games on that site [4]. More recently Alharthi et al. [12] have produced a taxonomy of idle games based on the mechanical features and the level of interactivity used by the game.

As with many of the early idle games, the popular idle game *A Dark Room* was designed to be "left running through the day" [32] while players get on with other tasks and only occasionally attend to the game. This can be though of as "progress while on" as the only criteria for the game to progress is that the game is open and running. When *A Dark Room* was ported to mobile, this changed so that there was no requirement for the game to be open to run. This feature of some incremental games such as *AdVenture Capitalist*, identified by Pecorella [4], is "progress while gone". With this feature the player is rewarded for time that has passed even when the player closes the game completely. When they next open the game they can see what progress has been made while they were away.

Thus, idle games have moved from simply being "on" to having a variety of interactions and some of them social. Nonetheless, a key part of the game mechanics is at some point doing nothing, even to the extent that the game can be "off." This mechanic leads to a very different style of engagement as players know that in some games they can still make significant in-game progress even if they only actively interact with the game itself for short periods of time.

2.2. The Experience of Playing Idle Games

In order to understand engagement in idle games, it is necessary to understand what the possible experiential outcomes of such a game might be. Alharthi et al. [12] looked in detail at idle games producing a taxonomy of idle games based on both the mechanics underlying the games and the level of interactivity required by the player. Though this encompasses the range of games that we have considered here, engagement is usually considered to be emergent from a synthesis of features in the games [37]. Thus, to investigate the experience of playing idle games such as *Neko Atsume*, we have identified the higher level features of idle games, namely:

- Discovery
- Collecting
- Progression
- Waiting

Understandably, these overlap in some sense with Alharthi et al.'s taxonomy though we consider each in turn with regards to player experience.

[1] www.kongregate.com

2.2.1. Discovery

A central appeal of idle games is the "joy of discovery" as the games gradually reveal new content and mechanics [38, 39]. Some of the apparently simplest idle games, often described as 'clicker' games merely ask the player to click on a button. In *Cookie Clicker* the player clicks on a picture of a cookie. Generally the only immediate feedback provided is a number incrementing (another term for these games is 'incremental games'). Only after clicking a certain number of times do additional game mechanics become available so that players can discover how they affect the game. In most 'clicker' games the players acquire tools which automate the clicking process. Gameplay therefore soon consists of watching various scores increasing while managing the tools to optimise this process. *Candy Box* [40, 41] develops over time so that the player undertakes quests and kills monsters. Such games, including *Candy Box*, often acquire an unexpected story line. Typically, players discover that the story which starts as one genre takes an unexpected turn and ends as something completely different. *Spaceplan* [42] is such a game, but is unusual in that it has a ending.

2.2.2. Collecting

A feature some idle games have adopted from social network games is the inclusion of virtual goods. These virtual goods include so-called "vanity" items. Vanity items serve no mechanical (in-game) purpose [43]. However, players report valuing in-game items for self-expression, sociality and relationships in addition to their in-game usefulness [43]. Vanity items are often also collectable. Making collections of in-game items, whether or not this behaviour is unrewarded in the game, is a common motivational design pattern which may be related to experiencing the theme of the game [44]. The items one has collected may represent status and identity, extending material culture from the real world into the digital [45]. Rare items are perceived by players as more valuable [43], and as such strategic rarity can be used to increase the worth of virtual goods in the eyes of players [46]. Thus, the act of collecting can be a reward in itself for players and so motivate their engagement with the game.

2.2.3. Progression

As identified by Alharthi et al., automated progression is a core feature of most idle games. Indeed, early idle games (e.g. *Progress Quest*) parodied progression systems in RPGs [17, 47], implying that that progression removes the need for player skill. In idle games, progression generally consists in a single number increasing (far simpler than most RPG systems [47]), be it the quantity of cookies baked in *Cookie Clicker* or the watts generated in *Spaceplan*. These sorts of game have been appropriately termed 'incremental games', and their core game element described as "numbers getting bigger" [38]. An analysis of several popular games of this sort reveals that although the rewards in these games increase linearly, the amount of effort needed to receive them increases exponentially [38]. This correspondence can be well expressed through simple formulas [48] which can be applied to the design of new incremental games.

Of course, progression, even if arbitrary, is understood to be an important constituent of player experience. Progression underpins the sense of flow in a game [9, 49], though normally in relation to overcoming a challenge which idle games can sometimes lack. Progression is also identified as a component of the immersive experience, even without reference to challenge [8].

2.2.4. Waiting

Another key part of idle games is idleness itself. This is a period of time where there is little or nothing that the player can do. This encourages players to leave the game and return regularly.

The cycle of waiting and returning is popular in free-to-play titles such as *Game of War* [50], possibly because letting players "pay not wait" is a successful monetising strategy as it lets players pay to avoid an inconvenience of the game [51] (Although there are also some players who never pay on principle [14]) . However it also encourages players to play regularly for short periods of time, designed to fit around the players' schedules [46]. This works particularly well for mobile games as players can check the game for small periods of time throughout the day.

Lewis et al.[44] gives several design patterns which are used in social network games to encourage players to wait and return to the game for short periods of play. Random reward schedules mean that when players return there is the possibility for an unknown reward. In addition to this, a 'Returning Bonus' is a reward for consecutive play sessions (such as once every day). 'Harvesting' is a design pattern where players must invest a resource and regain it later

when it is more valuable. However, 'Withering' is a pattern where players are penalised for not returning within a time frame. To encourage players to wait, 'Energy Systems' [14, 44] are used in games such as *Farmville*. An energy system gives players a certain number of lives or points per day. Once these have run out the player needs to wait until the next day to play the game again.

In contrast, most incremental idle games have natural lulls in the action of the game where the player must wait for the number to increase once more. They tend not to penalise players who do not return regularly or impose arbitrary restrictions on when they must return for the greatest reward. Sometimes, having been away for longer, they are rewarded with a larger pool of accumulated points to spend [4]. However, the more frequently the player returns, the faster they will progress.

In some sense, waiting is not a player experience. However, the ebb and flow of active interaction does fit with the process model of engagement [10] as discussed below and moreover, could be considered as feeding the sense of uncertainty the player feels about what will happen in the game [52]. Thus, waiting works to build up the experience of these particular games.

2.3. Engagement in Idle Games

No existing work has addressed what is engaging about idle game experiences. As such there are no available models or measures used to quantify idle game engagement. We must look to general models of game engagement.

Existing models of game engagement are largely focused on few, clearly delimited game sessions. The *Process* model of engagement [10] describes a point of engagement (when someone starts playing the game), followed by a period of sustained engagement (when they are playing the game), ending with disengagement (when they stop playing). Subsequently there may be re-engagement, leading to another period of engagement followed by disengagement, and so on. There can also be cycles of engagement within a game, where players engage with particular sub-activities, maintain a period of engagement with them, and then disengage, returning to other aspects of the game. Similarly, the *Expanded Game Experience* model [53] considers a wider experience of games than just during play. It includes the process of choosing to play, choosing which game to play, afterplay and choosing whether to play again. Both of these models frame the game activity as being delimited by two meta-game choices: 'What should I play?' and 'Should I stop playing now?'. These choices are of a different kind to the choices within the game and are affected by meta-game concerns such as aesthetics, motivation, novelty and interest. This separation between play and non-play time works well for understanding disengagement in a game such as *Call of Duty* [54], an intense, competitive first-person shooter. Here there is a clear distinction in behaviour and experience between deciding to play, playing, and having stopped playing. However, these models do not really consider the longitudinal nature of engagement in a game like *Neko Atsume*.

Experiential measures tend to ask players questions about their experience (e.g. "To what extent did the game hold your attention?"). There are many existing experience questionnaires such as the User Engagement Scale (UES) [55], Immersion Experience Questionnaire (IEQ) [8], Game Engagement Questionnaire (GEQ) [56] and PENS [57] which may be used as experiential measures of engagement. This type of approach equates engagement with experience. It is appropriate for measuring short term engagement such as over a single game session, but does not address motivations around the game such as reasons for returning to the game. As all of these measures focus on a single period of interaction, they are not suited to an investigation of progress-while-gone engagement.

Behavioural measures of engagement [58] address behaviours surrounding the game, such as the length of time spent playing. As such, behavioural measures seem more appropriate for quantifying long-term engagement where it is likely that the experience of engagement may vary over time or over game sessions. This type of approach claims that to be engaged in a game is to perform particular behaviours, such as playing frequently or over long periods. As such, behaviours of engagement do not in themselves demonstrate that engaged players are having a positive experience of the game. This is in contrast to experiential measures that take a poor experience as evidence of low engagement.

Przybylski et al. [59] contrast *harmonious engagement* with *obsessive engagement*. They find obsessive engagement to be correlated with both negative player experiences and long play times. However, as their participants played games for a mean of 13.39 hours a week, it is uncertain how strongly these results inform the study of games which are played for a few minutes a day, such as many idle games, including *Neko Atusme*. We could imagine that if player retention is due to addictive game mechanics, this might lead to high retention rates (and thus high reported

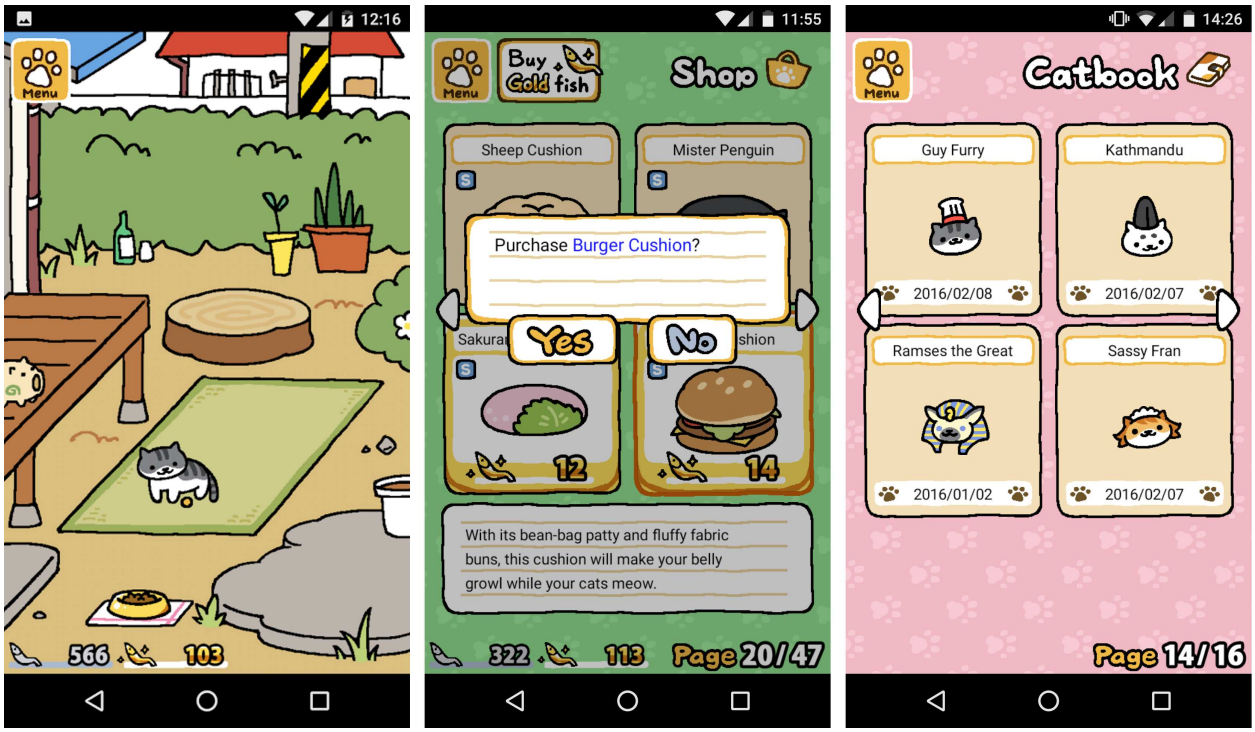


Figure 1: From left to right, the *Neko Atsume* Yard, the Shop and the Catbook. The yard shows pictures of cats and the gifts of silver or gold fish left by those cats that have come and gone. The icon in the top left provides access to a menu. The amount of fish owned is shown at the bottom left. Tapping on a cat brings up their page in the player's Catbook. In the shop players can buy the various toys that they use to attract cats to their yard. Some items can be bought for silver fish but others need the more valuable gold fish. Once a cat visits your yard once it appears in the Catbook which is a record of all the cats that have visited. If a cat came to the yard but you didn't see it then it is represented by a greyed out silhouette. (Screenshots from second author's copy of *Neko Atsume* by Hit-Point)

behavioural engagement) without necessarily increased enjoyment. However, in the absence of this, it is likely that players who voluntarily display behaviours of engagement over a prolonged period are also having a more positive experience.

Behavioural measures are relatively uncommon. Boyle et al. [60] performed a systematic review and found 55 papers, 13 focused on subjective experiential measures but only 7 focused on behavioural measures. Similarly, in a systematic review of digital game enjoyment studies [5], the vast majority of reported studies use subjective self-report questionnaires. The review found very little consideration of social factors on enjoyment and none of the games considered were casual or idle games.

If existing models and measures of engagement do not consider progress-while-gone engagement, how can we investigate it? Is it really an important mechanic which generates high engagement, or is it just a bit of window dressing and the real engagement happens elsewhere in the game? What makes *Neko Atsume* particularly interesting is that it is a popular game which has been downloaded by millions of people but the core interaction is a progress-while-gone waiting mechanic. There are a few other things that you can do in the game such as choosing toys and taking pictures but the core mechanic is waiting. This makes it an excellent choice for investigating the progress-while-gone game experience and it is worth looking at in more detail.

3. Neko Atsume

Neko Atsume:Kitty Collector is a casual game available on both iOS and Android. The name *Neko Atsume* can be translated from Japanese into English as *Kitty Collector* and this name reflects the main goal of the game which is to collect cats. The core game loop involves three primary screens: the Yard, the Shop, and the Catbook.

Players own a 'Yard' and can use the game's currency (silver and gold fish) to buy 'goodies': cat toys or food. They then place the goodies in their yard, close the game and wait. If they return to the game over the next few hours, they may find that there are one or more cats in their yard. These cats will only arrive while the game is closed. Each cat will also bring the player a gift of additional fish currency.

The 'Shop' lets players buy the different toys and food items to place in their yard. Once bought these items move to the player's 'Goodies' screen which lets them choose which ones they want to place in the yard. Interacting with both of these toy screens takes longer than just checking for cats as there are over 150 different toys that can be chosen. Different cats are more likely to come for particular toys so this choice may require more thought and a deeper level of engagement.

The player has a 'Catbook' which serves as a record of all the cats which have visited the yard. Players have the option to take pictures of the cats and collect these pictures in their Catbook.

Neko Atsume's success and favourable reception by critics [28] may be due in part to its success in incorporating the four casual game design values proposed by Kultima [61], namely: acceptability, accessibility, simplicity, and flexibility. The cat aesthetic is highly acceptable to diverse audiences. The game is free and easy to learn, making it highly accessible. It has few, carefully chosen elements with no unnecessary cognitive overhead, giving it high simplicity. Finally, the game is flexible as to when, where, and for how long it is played.

3.1. Waiting and Checking

Beyond the actions described above, players have a meaningful choice to make as to when to close or reopen the game. Cats visit the yard some time after food has been placed for them, but if you wait too long to see them, they will have left again. There is never a penalty for opening the game, beyond the time it takes to do so. This is in stark contrast to energy systems popular in social network games, where – once the player has expended all of their 'energy' – they must pay to reopen or continue the game.

To encourage players to reopen the game, *Neko Atsume* shares some of the motivational design patterns identified by Lewis [44] within social network games. Putting out food for cats could be seen as an example of 'harvesting', where an investment of resource is made which is later repaid, here in the form of the in-game fish currency. It does not directly implement the 'withering' pattern, where failure to return within a time period is mechanically penalised by a decrease in value of the reward. However, if the player's goal is to see cats, this must be done within a time window.

The association of player behaviours (putting out food, checking for cats) with rewards (cats, fish and mementos) can be seen as an example of *operant conditioning* [62, 63]. The core game loop is mediated by a variable reward schedule. Providing a reward at random intervals after an action produces much higher motivation than a predictable action reward system. Operant conditioning has been a design feature of many different types of game, it is used most notably in slot machines [64] but also casual games such as *Candy Crush Saga* [65, 66].

Like social network games, players can "pay not wait" to speed their acquisition of the fish currency. A player may be tempted to purchase fish currency rather than collect it over time in order to purchase a particular toy, for example. However, even in such a situation, they still have no choice but to wait to see which cats that toy attracts.

3.2. Collecting

There are three kinds of collectable items in the game: cats which have visited, goodies, and mementoes.

There are 58 different cats in the game at time of writing. Each cat has a different name and animation, and is attracted to particular goodies. However, just because the player has put out the right goodies does not mean that a given cat is guaranteed to appear. Among these cats are a number of 'special cats' which wear costumes and (in the English translation) have punning names. For example, 'Joe DiMeowgio' wears a baseball outfit complete with cap and bat, a clear reference to Joe DiMaggio, the American baseball player. Most of these special cats are attracted only by the more expensive goodies. This requires players to collect a lot of the fish currency, either by spending a lot of time attracting the more common cats or by spending real money.

The goodies themselves are collectable (excluding food, which is consumed). There are unique animations with many of the goodies that can only be seen when a cat plays with them, perhaps contributing to the "joy of discovery".

Finally, if a particular cat has visited the player many times, it may bring the player a 'memento'. This is an illustration of a small item such as a 'flowered collar'. Mementos appear in the player's 'memento book' and have no functional purpose in the game, but some players try and collect them all.

Of these collectable items, cats and mementos are vanity items as they do not have an effect on the game mechanics. The size of one's collection could be seen as an form of game score or progress, though this association is never made explicit. Rather, players may find intrinsic value in the collection, or it may give them a social status that mirrors that of wider material culture [45]. Strategic rarity is used for rare/special cats which may make players see these as more valuable.

3.3. Socialising

Neko Atsume does have the opportunity to allow people to socialise around the game through a built-in option to send pictures of cats and of a player's yard to the social network, Twitter. Pictures can also be saved to the player's device and shared with external applications though, of course, that need not lead to further socialising. As Paavilainen et al. note this kind of social mechanic "isn't that social" (sic) [25]. This contrasts with other games, such as *Farmville*, which encourage players to make use of their social connections to gain in-game advantages and arguably distort social relationships into an exploitable resource [24].

This is not to say *Neko Atsume* lacks sociability entirely. Stenros et al. [67] have discussed many types of sociability in games. For single player games the main forms of sociability that they discuss are competition via score boards or the the idea of games as *performance*. Performance describes the idea of other people watching while a single person plays, typically for games such as *Dance Dance Revolution* in an arcade setting. *Neko Atsume*'s sociability is different from this. The actual act of gameplay is very solitary, players probably play on their own on a mobile phone which makes it difficult for others to watch. However, this gameplay produces pictures of cats which can then be shown to others which would make the overall experience more social. So, even though other players are not taking part in the gameplay they would share in the rewards and so produce a sociable experience about the game rather than for the game.

4. Method

The aim of this study is to capture the main activities of players in and around the game of *Neko Atsume*. To this end, we used a questionnaire study and solicited participants online.To analyse the data, we were looking to understand the relationships between the different behaviours represented in the survey and therefore analysed through descriptive accounts of the responses including an exploratory factor analysis following the methodology described in Hair el al. [68].

4.1. Measuring Engagement

We felt that a behavioural measure of engagement was best suited for characterising the sort of long-term engagement observed with a game like *Neko Atsume*. Experiential measures make very little sense as the game is played for numerous very short periods of time and measuring the experience of each one is almost impossible. We make the assumption that progress through the game is an indicator of engagement. The rationale for this is that the more engaged players are the more likely they are to play for longer and so make more progress.

4.2. Questionnaire Development

The goal of the questionnaire was to capture player's reports of their activities with the game in terms of the activities they engage in and to what extent they engage in them. Because these activities are inherently limited, it was possible to exhaustively cover all the major activities. A set of questions were developed to characterise a) long-term patterns of behaviour of *Neko Atsume* players; and b) social sharing behaviours of *Neko Atsume* players.

Seven questions were concerned with patterns of activity with the game. This included how long they have been playing, how frequently they play, how far they have progressed in the game, how frequently they check what they have and have not collected, and whether they had paid for the game's virtual currency.

We asked sixteen questions about social sharing behaviours related to the game. This included whether players talk about the game with others, share sightings of new cats and purchases of new toys, and also whether they post to *Neko Atsume* forums. We also asked what face to face interactions they had about the game.

There were three further demographic questions regarding age, device used and the language in which the game was played. All of the questions were mainly closed multiple choice and "Other" options were added where appropriate to allow free text entry.

Once the questionnaire was developed, we ran a face-to-face pilot of the questionnaire on four participants. This identified some minor errors and clarifications necessary. The pilot also tested the length of time needed to complete the questionnaire which was about 3 minutes. We added two speculative questions at this point. These addressed a feature that is not currently in the game, which is the ability to trade in-game items with other players. The results of these questions are not analysed here. For the full questionnaire see *9 Appendix 1: Full Questionnaire*.

4.3. Procedure

We used an online questionnaire to survey players of *Neko Atsume* on a popular Reddit community[2]. This community had approximately 8,000 members when we launched the questionnaire. We posted a link to the questionnaire onto the forum. The link was labelled “Serious researchers asking serious questions about your cats (3 minute survey).” We also created an image of one of the cats from the game wearing a mortarboard. The questionnaire was active for 48 hours.

4.4. Participants

We had 1972 responses to the questionnaire. The questionnaire received 2,929 unique visitors, 70% of whom responded. Inspection of the response IP addresses showed that they were all unique. This suggests that the responses were genuine and that no one filled in the questionnaire more than once.

5. Results

5.1. Patterns of Behaviour

Most players (38.9%) had been playing for between 2-4 weeks. However, 35.7% had been playing for more than a month and significant minority (10.8%) had been playing for more than 3 months. At the time of the survey the game had been available in English for 2 months which suggests that some of these players were playing the original Japanese version. This is supported by the answers to the language question in which 4.7% of players said they played in the Japanese version even though they didn’t speak Japanese.

Duration	**Players**
Less than 3 days	7.8%
4–7 days	17.5%
2–4 weeks	38.9%
1–3 months	24.9%
3–6 months	6.0%
6 months or more	4.8%

Table 1: Duration of play

Most players (67.5%) check the game more than twice a day. We also asked how often they checked which cats or toys they had collected within the game. The largest group (33.7%) only look at these screens every 3-5 sessions. This suggests that players tend to have several very quick engagements with the game during a day, where they check the game but do not check the status of their cats or toys, but they also have some additional deeper engagements once every day or two.

A significant proportion of players (25.3%) have bought gold fish using real money. Of these the majority (17.3%) have only paid once. The number paying more times than gradually tails off until only 0.1% report paying more than 10 times. The Apple App Store gives the most popular purchase as 300 gold fish for £2.99 [69].

[2] www.reddit.com/r/nekoatsume

Frequency	Players
Many times a day	67.5%
A couple of times a day	29.0%
Once a day	1.6%
Once every few days	1.3%
Once a week	0.2%
Less than once a week	0.5%

Table 2: Frequency of play

Frequency	Players
Never	74.7%
Once	17.3%
2-4 times	7.0%
5-10 times	0.8%
More than 10 times	0.1%

Table 3: How many times players have used real money to buy in-game currency.

5.2. Social Sharing

Almost all players (89%) have talked to other people about playing *Neko Atsume*. Talking in person (78%) is more popular than talking online (49%).

We asked players whether they told other people when they saw a new cat, for three means of communication. Most players (78%) have communicated in person. This compares with 47.4% who have used email or instant messenger (IM), and only 28.2% who have used social media. Similarly, we asked players whether they told other people when they bought a new cat toy, for the same three means of communication. A similar pattern was reported, though the proportions were lower. Slightly under half (45%) had communicated in person, 27% had used email/IM, and only 10% had used social media.

Method	Shared new cat	Shared new cat toy
In person	78%	45.6%
By email or IM	47.4%	27.2%
On social media	28.2%	10.9%

Table 4: Methods of sharing new cats and new toys

It may be that players prefer the more targeted one-to-one communication methods rather than the broadcast approach of social media. For instance, one pilot participant said “I’m a 28 year old man. I don’t want to post pictures of cats on Facebook where my old army buddies will see them.” This echoes a finding by Paavilainen et al. [25] that quoted some players as saying that they did not want their friends to know they were playing social games as they were seen as "lame" (sic). We do not have the qualitative data from this survey to explore this issue further.

Players are less likely to share that they have bought a new toy than if they’ve seen a new cat. This may be because the appearance of cats is not predictable so it’s a more surprising or interesting event. Alternatively it may be because the main aim of the game is to see cats and the toys are just a means to this end.

We asked players what would make them more likely to share a sighting of a new cat. The most popular reason (72%) was “It’s a rare cat”, followed by “It’s a cat you’ve been trying to get for a while” (58%) and “It’s a great picture” (51%).

Neko Atsume gives no advantages or rewards for sharing. Therefore players are solely motivated by their own intrinsic reasons. The game contains a number of “special” cats which wear clothing and are comparatively rare. This

Reason	Would make me more likely to share
It's a rare cat	72%
It's a cat you've been trying to get for a while	58%
It's a great picture	51%
It's a cat that someone else hasn't got	24%
Nothing	8%

Table 5: Reasons that make players more likely to share that they've seen a new cat

means that "It's a rare cat" could refer to both the likelihood of seeing the cat and also whether it's a special cat which has a more interesting picture.

These results suggest that player sharing is motivated by a combination of achievement factors ("It's a cat you've been trying to get for a while") and purely aesthetic/affective factors ("It's a great picture").

5.3. Posts to forums

Almost all (99%) respondents report that they check online forums about *Neko Atsume*. That this is not 100% is surprising since the questionnaire was posted on such a forum. It is not clear how the other 1% found the questionnaire, if they are being truthful. A quarter of respondents (25%) report that they post to online communities about *Neko Atsume*.

5.4. Principle Component Analysis

In order to understand the relationship between the different activities that players did in the game, we conducted a principle component analysis (PCA) on the 18 questions that asked about players' actions in or around the game (see Table 6). We follow the typical practice for exploratory factor analysis specified by Hair el al. [68]. Before the analysis, the set of items were checked using the KMO Measure of Sampling Adequacy (MSA), Bartlett's test of sphericity and individual item MSA [70]. These indicators suggested that the 18 items were suitable for PCA, though the individual item MSA for frequency of checking (Item 2) was poor (0.576). Nonetheless, it was left in for the initial analysis and was found to fit with the other items, so was left in for all subsequent analyses.

A scree plot suggested 3-5 principle components. An analysis of the different loadings indicated that the four factor solution was the most descriptive and explained 47.3% of the total variance. Without prior expectations on what the factor structure might be like, oblique rotation is considered best practice to allow for the possibility of correlations between factors [71]. In practice, because of the small correlations found, there is not a substantive difference between the factors found with either oblique or varimax rotation. This rotation (Direct Oblimin) suggested 4 factors of: *Direct sociability*, *Time spent playing*, *Social media sociability* and *Checking frequency*, see Table 6. The four factors had only small correlations with each other ($|r| < 0.17$ in all cases), see Table 5.4.

The low correlations between the four factors suggests that the activities in and around the game dissociate into separate distinct groups that are not necessarily strongly associated with each other.

The *Time spent playing factor* reflects the unsurprising finding that the longer people play the more cats (r=0.75) and gifts (r=0.811) they collect.

Direct sociability relates to sociability about the game either in person or through email or Instant messenger. *Social media sociability* relates to 'broadcast' social media such as Facebook, Twitter or posting to forums. There is a slight correlation between social media sociability and checking frequency ($r = 0.163$) but this is not strong and it seems reasonable to consider *Direct sociability* as a completely separate factor to *Social media sociability*. This suggests that players see sharing in person or via email/IM as very different from sharing on social media. This may be because of the more targeted nature of in person interactions versus the broadcast nature of social media such as Facebook or Twitter. This result is also supported by the finding that direct sharing is much more common than social network sharing which was discussed earlier.

	Question	Dir	Time	Soc	Freq
12	In general, do you usually tell people in person when you've bought a new cat toy?	**0.740**	−0.050	0.087	0.214
13	In general, do you usually tell people by email/IM when you've bought a new cat toy?	**0.723**	−0.056	0.298	0.083
10	In general, do you usually tell people by email/IM when you've seen a new cat?	**0.666**	0.025	0.307	0.047
9	In general, do you usually tell people in person when you've seen a new cat?	**0.666**	0.102	0.039	0.279
5	How many other people do you talk to in person who play *Neko Atsume*?	**0.485**	0.192	0.035	−0.022
4	How many gifts have you received from cats so far?	0.092	**0.824**	0.085	−0.038
3	How many cats do you have in your Catbook at the moment?	0.117	**0.768**	0.119	0.093
1	How long have you been playing *Neko Atsume*?	0.066	**0.753**	0.096	−0.300
11	When you've seen a new cat, do you usually tell people on social media?	0.275	0.027	**0.739**	0.124
14	When you've bought a new cat toy, do you usually post to social media?	0.251	−0.001	**0.710**	0.121
8	How often do you post in online communities about *Neko Atsume*?	0.024	0.205	**0.689**	0.175
6	How many other people do you talk to online who play *Neko Atsume*?	0.054	0.175	**0.662**	0.055
15	How often do you check what cats or toys you have collected in the game?	0.114	−0.044	0.109	**0.787**
16	How often do you check which cats or toys you don't have or want in the game?	0.157	0.003	0.081	**0.791**
7	How often do you check online communities about *Neko Atsume*?	−0.041	0.173	0.333	**0.450**
2	How often do you check*Neko Atsume*?	0.135	−0.131	0.085	**0.409**
18	Have you used real money to buy gold fish?	−0.070	0.284	0.220	0.094
19	Thank you! Now we'd just like to know how old you are and then you're done!	−0.041	0.308	0.063	−0.288

Table 6: The factor loadings (structure matrix) for the questionnaire. Loadings above the magnitude threshold of 0.35 are emboldened. Dir = Direct Sociability; Time = Time spent playing; Soc = Social media sociability; Freq = checking Frequency.

	Dir	Time	Soc	Freq
Dir	1	0.010	0.127	0.111
Time	0.010	1	0.163	-0.062
Soc	0.127	0.163	1	0.153
Freq	0.111	-0.062	0.153	1

Table 7: Correlation between factors: Dir = Direct Sociability; Time = Time spent playing; Soc = Social media sociability; Freq = checking Frequency.

The *Checking frequency* factor shows that players who check one aspect of the game frequently are more likely to check the others as well. Included in this factor are the frequency with which players check the game (r=0.406), the frequency that they check online forums (r=0.454), the frequency that they check which toys they have (r=0.785) and the frequency that they check which toys they want (r=0.791)

The factor *Time spent playing* is very weakly correlated with *checking frequency*. The slight negative correlation (r=-0.062) suggests that checking frequency is essentially unrelated to how long players have played. *Time spent playing* is a measure of how motivated players have been to continue playing the game whereas *Checking frequency* may be due to other factors such as different player lifestyles or personality. Someone who is a teacher or a driver is unlikely to have much downtime to check the game very frequently compared to someone who works in a quiet shop or office. Differences in *Checking frequency* could also be caused by personality traits, players with a particular personality are more likely to check everything with great frequency. For example, Moore and Elroy [72] found a positive correlation between the *Extraversion* personality trait and how frequently people used Facebook.

Time spent playing is essentially uncorrelated with *Direct sociability* or *Social media sociability*. This also suggests that longer term engagement with the game is not associated with particular sociability around the game. Similarly, *Checking frequency* is not correlated with either of these two social factors. This suggests that although social aspects of the game are important they do not influence other aspects of behavioural engagement. That is, just because someone is highly social on the game doesn't mean that they will play for longer or check more frequently.

6. Discussion

Despite a small set of possible in-game activities and the requirement to close the game in order to progress, players of *Neko Atsume* can be reasonably identified as being "engaged" with the game. The survey demonstrates that many players are checking the game on a regular basis and over a protracted period of time. Moreover, sharing game events either in person or online, an activity supported by the game, supplements traditional gameplay. Interestingly, most of this sharing is in direct face-to-face contact rather than using social media. While "engagement" as previously defined in the literature is achieved only by a player actively playing the game, these out-of-game interactions suggest that players could still be considered to be engaged with the game even when not playing.

Long term engagement, of the kind seen in *Neko Atsume*, looks to made up of at least four distinct factors. Two of these, *Time spent playing* and *Checking frequency* correspond to the distribution of instances of gameplay. The other two factors *Direct Sociability* and *Social media sociability* correspond to out-of-game social sharing.

The nature of factor analyses is that the degree of correlation between factors is low (as interpreted according to Cohen's correlation guidelines [73]). This means that one cannot be inferred from another. To get an accurate picture of long-term engagement, there is no alternative to measuring each factor individually. While a questionnaire method worked in this case, long-term engagement behaviours that involve the use of the game may be collected using game telemetry. Social sharing behaviours may be similarly measured to the extent that they are integrated into the game application.

25.3% of players report having paid real money for gold fish within the game. This is much higher than the typical conversion rate for free-to-play games. For example *TechCrunch* [74] reports that less than 6% of the users of *Club Penguin* [75] pay for the service. However, this may be caused by biases in the sample of this study. Our sample was taken from players who visit the *Neko Atsume* forum on *Reddit* and it is reasonable to conclude that these players are more engaged than the 'average' player and thus more likely to spend money. What is interesting is that there is no strong correlations between how often players pay and any of the four factors we discovered. The strongest correlations are *Time spent playing* (r=0.284) and *Social media sociability* (r=0.220) but both are small correlations [73] so do not predict strongly how likely players are to pay.

It is possible that there are more factors that contribute to long-term engagement that we have not considered. For example, in a game where individual game sessions have a significant duration, the average amount of time spent within the game would be a likely factor. However, if the factors identified indeed constitute factors of engagement (and we have argued that they do), any measure or model of long-term engagement will need to capture them.

6.1. Implications for theories of engagement

The Process model allows for engagement to cover periods away from the direct use of the system. Within the Process model, the cycles of engagement and disengagement can occur at different levels of analysis. Engagement

can be viewed, for example, at a micro-level, which in *Neko Atsume* means where the player has opened the app. Engagement can be also viewed at a macro-level, where the interaction is considered in the broader context of the player [76]: between a player playing *Neko Atusme* for the first and the last time.

Many research measures provide means to examine the micro-level of engagement. In typical game engagement or immersion studies e.g. [77, 56], a player plays a game for a short but committed period of time, typically a few minutes, after which they rate their engagement with the game using a questionnaire. Similarly, the operational measurement for the process model [10], performed through the UES questionnaire [55], is administered to reflect on a session of engagement.

It is unlikely that macro-level engagement in *Neko Atsume* could be captured using a post-session questionnaire. The activity of engagement is distributed both over short play sessions but also in activities separate to the game itself. Activities engaging with the game are unscheduled and opportunistic.

Our survey, in asking about activities with the game in general rather than a specific instance of play is able to capture the behavioural patterns that represent the macro-level of engagement in this case. However, the questions we asked do not generalise to other games. Because of this we cannot meaningfully quantify the macro-level engagement of players.

The relationship between macro-level behaviours of engagement and the micro-level experience of engagement is not clear. Engagement at the macro-level may need to be considered as a cluster of related but independent behaviours that only weakly reflect players' felt experience of being engaged.

A measure of engagement might be seen from how often players think about the game and how often they initiate game activities, whether that is playing it, sharing a photo or talking to others about it. Cairns [77] identified this move of players from not playing into specific instances of play as something that has not been very well captured in research into any game.

Our study, in concentrating on the dynamics of the game, reflects the activities of play but perhaps sidesteps the appeal of the game. Writers such as Hunicke et al. [78] and Koster [79] have divided games into the *gameplay* (or *mechanics* and *dynamics*) and the *fiction* (or *aesthetics*). *Gameplay* refers to the structure and interaction of the game which is produced by computer code. *Fiction* refers to the graphics, storyline and text of the game. It is tempting when discussing genres of game to discuss them in terms of gameplay (e.g. First Person Shooter) rather than the fiction. For a game like *Neko Atsume* this would be a mistake. The appeal and longevity of the game is likely at least as much to do with the subject matter of cute cats as it is to the gameplay.

Para-play [80, 81] is the activity of socialising around a game. This is not an explicit, reified part of the game itself but is something that players of the game develop for themselves. Downs et al. [80] investigated the different types of paraplay created around console gaming. All of these types of play happened during the game amongst participants who happened to be currently present in the room. Para-play behaviours are usually considered for co-located players communicating synchronously within a bounded play session. *Neko Atsume* is different because the para-play, such as sharing cat pictures, is asynchronous and between players who are not co-located, people who do not share the whole game experience.

The MDA model [78] acknowledges that *Fellowship* is part of the Aesthetics offered by a game. However, this game makes no particular attempt to support Fellowship other than posting photos to Twitter. It would be hard to analyse the game using just this formal framework and thereby understand the opportunity for social engagement that the game offers.

Most studies of game experience look at the actual process of play in single session or the triggers at the limits of a session which make players start or stop playing. But they do not consider the frequency or regularity of play and where play becomes normalised into daily life. In fact, for *Neko Atsume* the actual game play is minimal and engagement lies mainly in the frequency and longitudinal duration of play. As such, playing games like this might be better viewed as a habit much like chewing ones nails or checking Twitter rather than being realised through a single session of play. Certainly some of the players of *Neko Atsume* could be described has having habitual play with regular sessions of play over a long period.

Researchers outside of games have investigated habits. Neal et al. [82] describe habits as "response dispositions that are activated automatically by the context cues that co-occurred with responses during past performance". Applied to *Neko Atsume* this means that the feedback that players get from a single session such as seeing a cat, having the possibility of a new cat or buying a new toy makes the player more disposed to playing another session in the future. Over time players may come to associate a particular context with play. They may check the game during a break at

work or check before meeting friends to see if there are new cats to show them. This association of context with play builds up the habit of play. Ji & Wood [83] assessed the strength of habits using a dual measurement approach. They used a questionnaire to assess the strength of participants' intentions to perform an action such as buying fast food. They then asked participants to fill in a post-event diary to assess whether they had actually performed the action. They considered that the strength of participants' habit corresponded to the difference between their intentions and their actions: the stronger the habit to act in certain way, the more likely it was to overcome intentions not to perform that action. Moore & McElroy [72] used a similar approach to understand participants' Facebook behaviour. They used a questionnaire to ask participants about their experience of social media and also to assess their personality. They then examined participants' actual Facebook posts and found that personality was a stronger predictor of Facebook behaviour than previous Facebook experience.

6.2. Limitations

Most of the limitations of this study come from the nature of large internet based questionnaires. The sample of respondents is probably biased towards players who enjoyed the game more and were motivated to visit the Reddit forum and fill out a questionnaire. By joining the forum these participants have already self-selected to engage in social activities around the game, so it is likely that their responses will be biased towards more sociability. Of those who started the questionnaire, 70% completed it which removed the less motivated participants from the sample. The questionnaire relies on self-reported data and participants may not remember or report their experience accurately. Similarly, players perform many actions during their game experience and a questionnaire is limited in the level of detail which can reported. Many of these issues could be avoided by gathering detailed game analytics instead of the questionnaire. However, this would have needed extensive involvement from the developers of the game.

The questionnaire is also limited in the range of questions and possible answers. We developed the questionnaire by playing the game and talking to players but it is possible that interviewing more players may have produced a richer set of data. *Neko Atsume* as a game is something of an outlier, even compared to other idle games. Although this makes it interesting to study, it may be that some of our findings do not generalise to other games because the difference in game design is too large.

6.3. Further work

Neko Atsume is a game with a mode of engagement that current models of engagement recognise but struggle to capture in actual player behaviours. A key weakness is how capture and characterise longitudinal engagement over multiple play sessions. Longitudinal play is an essential feature of many games from the persistent world of *World of Warcraft* [84] and the team-based competition of *DOTA 2* [85] to the social sharing of *Farmville*. How these games create engagement over time is not well understood and ripe for future investigation. Future studies could explore this game further at the micro-level of game analytics or the macro-level of player experiences. But further studies should also look at other games which push the level of engagement outside of the game itself such as *Pokemon GO* [86], where walking somewhere in the real world in order to play is as much a part of the game as the actions taken within the game.

Future work to investigate engagement in longitudinal games could consider play sessions as a habit influenced by contextual factors and consider both players' reported experience and intentions as well as their actual actions. For some games these actions could be recorded using data analytics techniques. However, in Neko Atsume this would miss the face to face sociability aspect so players' actions could be recorded using a diary approach instead.

7. Conclusions

Neko Atsume is a relatively recent game (released in 2014) which challenges our perceptions of what a game can be, how engagement is generated and measured and how games can create social connections between players. In particular, it highlights gaps in our existing understanding of what it means to be engaged in a game at the macro-level of engagement. New games and games genres are being created all the time and no doubt new games will be created in the future which further challenge these perceptions and must give us pause.

8. Acknowledgements

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9. Appendix 1: Full Questionnaire

1. If you have Neko Atsume, what language is it set to?
    - English
    - Japanese (and I can read Japanese)
    - Japanese (even though I can't read much Japanese)
    - I don't have Neko Atsume

2. Have you played Neko Atsume on a
    - Phone
    - Tablet
    - Other

3. How long have you been playing Neko Atsume?
    - Less than 3 days
    - 4-7 days
    - 2-4 weeks
    - 1-3 months
    - 3-6 months
    - 6 months or more

4. How often do you check Neko Atsume?
    - Many times a day
    - A couple of times a day
    - Once a day
    - Once every few days
    - Once a week
    - Less than once a week

5. How many cats do you have [in your Catbook] at the moment?
    - I don't know
    - 1-5
    - 6-10
    - 11-25
    - 25-40
    - 40+

6. How many gifts have you received from cats so far?
    - I don't know
    - 1-5
    - 6-10
    - 11-25
    - 25-40
    - 40+

7. How many other people do you talk to in person who play Neko Atsume?
    - None

- 1-2
- 3-5
- 6-10
- 11+

8. How many other people do you talk to online who play Neko Atsume?
    - None
    - 1-2
    - 3-5
    - 6-10
    - 11+

9. How often do you check online communities about Neko Atsume?
    - Once a day
    - Once every few days
    - Once a week
    - Less than once a week
    - Never

10. How often do you post in online communities about Neko Atsume?
    - Once a day
    - Once every few days
    - Once a week
    - Less than once a week
    - Never

11. In general, do you usually tell people in person when you've seen a new cat?
    - Always
    - Mostly
    - Sometimes
    - Never

12. In general, do you usually tell people by email/IM when you've seen a new cat?
    - Always
    - Mostly
    - Sometimes
    - Never

13. When you've seen a new cat, do you usually tell people on social media?
    - Always
    - Mostly
    - Sometimes
    - Never

14. Which social media sites have you posted to about getting a new cat?
    - None
    - Facebook
    - Twitter
    - Reddit
    - Other _____

15. What would make you more likely to tell someone that you've seen a new cat?

- It's a rare cat
- It's a cat you've been trying to get for a while
- It's a great picture
- It's a cat that someone else hasn't got
- Nothing
- Other _____

16. In general, do you usually tell people in person when you've bought a new cat toy?
    - Always
    - Mostly
    - Sometimes
    - Never

17. In general, do you usually tell people by email/IM when you've bought a new cat toy?
    - Always
    - Mostly
    - Sometimes
    - Never

18. When you've bought a new cat toy, do you usually post to social media?
    - Always
    - Mostly
    - Sometimes
    - Never

19. Which social media sites have you posted to about buying a new cat toy?
    - None
    - Facebook
    - Twitter
    - Reddit
    - Other _____

20. What would make you more likely to tell someone that you've bought a new cat toy?
    - If it was expensive
    - If it was a toy you've been wanting to get for a while
    - If it looks good
    - If it's a toy that someone else hasn't got
    - Nothing
    - Other _____

21. How often do you check what cats or toys you have collected in the game?
    - Every play session
    - Every other play session
    - Every 3-5 play sessions
    - Every 6-9 play sessions
    - Every 10 or more play sessions
    - Never/Almost never

22. How often do you check which cats or toys you don't have or want in the game?
    - Every play session
    - Every other play session
    - Every 3-5 play sessions

- Every 6-9 play sessions
- Every 10 or more play sessions
- Never/Almost never

23. Would you like the game to let you trade toys with other players?
    - 1 (No, I'd hate that)
    - 2
    - 3
    - 4
    - 5 (Yes, that'd be cool)

24. Would you like the game to let you trade gifts that you've received from cats with other players?
    - 1 (No, I'd hate that)
    - 2
    - 3
    - 4
    - 5 (Yes, that'd be cool)

25. Have you used real money to buy gold fish?
    - No
    - Once
    - 2-4 times
    - 5-10 times
    - More than 10 times

26. Thank you! Now we'd just like to know how old you are and then you're done!
    - 10 or younger
    - 11-16
    - 17-21
    - 22-35
    - 36-49
    - 50-64
    - 65+

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