Using the Change4Life Disney Branded 10-minute Shake Ups During the COVID-19 ‘Lockdown’

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ABSTRACT

Physical activity (PA) is considered essential to overall health yet it is consistently reported that children are failing to meet the recommended levels. Due to the bidirectional relationship between affective states and PA, affective responses are a potential predictor to long term engagement. Since late March 2020 the UK government enforced ‘lockdown’ measures to help control the spread of Coronavirus (COVID-19); however, this has impacted children’s PA. Using online resources at home to support PA is now common. The primary aim of this research was to investigate the use of the Change4Life 10-minute Shake Ups to support PA by examining the effects of Disney branding upon children’s (n=32) post activity affective responses and perceived exertion. The secondary was to investigate the effect of the lockdown on PA habits. Children had similar positive affective responses and perceived effort to activities; however, branding was considered to be a key contributing factor based upon qualitative feedback from parents. Children’s PA levels dropped slightly since ‘lockdown’ was imposed; though online resources have been utilised to support PA. The use of immersive elements such as characters and narrative in PA sessions, as well as utilising online resources during ‘lockdown’ appear potentially promising for future research.
1.0 INTRODUCTION

Early development of healthy behaviours, including physical activity (PA), may play a prophylactic role in health outcomes [1]. PA is an essential part of a child’s overall health and wellbeing [2], and the World Health Organisation currently recommend children engage in at least 60 minutes of moderate to vigorous PA daily; however, there are consistent reports that children fail to meet these guidelines [3-4]. As a result, many public health organisations consider promoting PA in children a high priority [5].

Tackling this issue requires understanding of the psychosocial factors that impact these behaviours [6]. There is currently a theoretical transition away from social cognitive models for determining PA, towards the affective response as a predictor of engagement [7]. The bidirectional relationship between affective states and PA emphasises importance of promoting positive emotional responses during PA sessions to influence long term participation [8]. This is supported by hedonic theory: that people are more inclined and motivated to engage in activities that bring them pleasure, and how the response to the behaviour becomes a determinant for future behaviour [9]. In short, if children enjoy PA sessions this is expected to positively influence future engagement.

One approach that has previously been used to influence children’s PA levels is social marketing i.e. “the use of marketing principles and techniques to influence a target audience to voluntarily accept, reject, modify or abandon a behavior for the benefit of individuals, groups, or society as a whole” [10]. Social marketing is well placed to create change through its use of commercial marketing strategies to sell healthy behaviours [10]. Public Health England developed a strategy using social marketing to steer individuals towards making healthier lifestyle choices [11]. In their resources aimed at children, Change4Life have teamed up with Disney. Using brands such as Disney to help influence behaviour is not a new approach; research highlights Disney films often include messages expressed in a captivating way, and the films, characters, and narratives can help to shape the values, attitudes, behaviours, and encourage new ways of thinking about issues [12]. Furthermore, previous Chairman and Chief Executive of the Walt Disney company, Bob Iger, pledged the company’s commitment to using the unique relationship that children have with Disney characters in a positive way to help families lead healthier lives [13].

For many children Disney characters are associated with positive emotions; therefore, when the character is associated with something (e.g. PA) the emotions are also [14]. Research has found that characters attract children’s attention, improve product recognition, and create positive brand attitudes [15]. Advertisers use pictures and simply drawn animations of funny, brightly coloured characters on the front on their products to entice in children [16]. Children also develop special relationships with these characters known as a parasocial interaction. After exposure to the character children tend to see them as a friend and want to be part of that characters social world [17-18]. Using characters to promote PA therefore has potential to influence behaviour. However, more research into this area is needed to ascertain the specifics that aid in the promotion of PA.

At the time of this research (March-April 2020) the UK, along with the rest of the world, was dealing with the Coronavirus pandemic (COVID-19) which resulted in many far reaching health, social, and economic implications [19]. A ‘lockdown’ was enforced by the UK government to help control the spread of the virus; however, there were numerous undesirable effects including a reduction in PA [20]. Many were no longer able to participate in recreational sport or actively commute to work or school [20]. Preliminary data from Italy investigating the effect of ‘lockdown’ on children’s PA showed time spent in sport activities decreased by 2.3±4.6 hours per week (p=0.003) and screen time...
increased by 4.84±2.4 hours per day (p=0.001) [19]. Similar results have been seen in the UK. Sport England’s (2019) most recent Active Lives Survey data showed that 46.8% of children were achieving at least 60 minutes of PA per day. However, their survey data showed a substantial drop as a result of ‘lockdown’ with only small fluctuations over the past ~3 months [22]. During ‘lockdown’ many children and parents were in need of resources to support PA indoors or in their own garden. Change4Life provides just such resources for children including the “10 minute shake ups” involving Disney branded PA ideas that are easy and simple to complete. They require minimal equipment and participants, and thus were perfectly placed to aid promotion of PA during the lockdown.

This research therefore had two aims: firstly, the primary aim was to investigate the effect that Disney character branding had on children’s post activity affective responses and perception of effort through the implementation of the Change4Life Disney branded 10-minute shake ups; secondly, due to the timing of the research, a further aim was to explore children’s PA habits more generally.

2.0 METHODS

2.1 Study Design

An experimental within participant randomised cross over study design was used. Ethical approval was gained from the lead authors institution, Solent University, Southampton, UK (budze2020). After reading the participant information sheet (PIS) and being afforded the opportunity to ask any questions, the parents completed an informed consent, and the children filled in an assent form. The study was pre-registered on Open Science Framework in April 2020 (https://osf.io/prd8y) and all materials, code, and data are available on the project page (https://osf.io/f7dpx/files/).

2.2 Participants

Participants were recruited through social medial posts targeted at parents of those children that met the inclusion criteria. Children were included in the study if they were currently of primary school age (4-11 years); however, if a child was due to start school in the current academic year they were also included.

The target sample size for the survey was 40-80 participants completing four activities for each condition (branded vs non-branded) based upon power curves from simulation. Sample size estimation was based upon data in a previous study [29]. Details are available in the pre-registration. It was anticipated that not all participants would complete the study and so we aimed to recruit at the upper end of this range. In total 105 parents initially responded to take part in the research, 69 returned the consent forms and were given the activity packs (see below), with 32 of these being returned to the researcher. All participants who failed to return their packs were contacted two weeks later; if they did not respond then they were not contacted again. Thus, in total there were 32 participants in the study, 14 males (average age = 8.5 years ± 2.1) and 18 females (average age 8.1 years ± 1.5). Of this nine were in Key Stage 1 (KS1) (average age 6 years ± 1.1) and 23 were in Key Stage 2 (KS2) (average age = 9.3 ± 1.1).

Once parents contacted the researcher they were given an information pack containing a PIS, informed consent and assent forms, plus a short questionnaire on their child’s PA levels before and after the ‘lockdown’. Once these were returned to the researcher they were randomly assigned into either order A (branded followed by non-branded) or order B (non-branded followed by branded). The randomisation was based on household.
2.3 Procedure

The study used eight days of activities with two ten-minute activities being prescribed for each day. Children were split into one of two orders (A & B) as noted above. Four of the days were 10-minute shake ups taken directly from the Change4Life website (branded), and the other four days were the exact same exercises but all of the associated branding had been removed (non-branded).

For the branded exercises the packs included a branded image, title and the characters associated with the activity, a link to the demonstration video, a link to a branded timer, and a set of instructions. An example of this can be seen in figure 1a below; these were called the ‘branded’ sessions. The other four days of the program were the same exercises however with a non-branded title, no image or character, no video, a non-branded timer, and a set of instructions. An example of this can be seen in figure 1b below; these were called the ‘non-branded’ sessions. In order A the children completed all four days of the branded exercises first, and then the four days of non-branded sessions after; in order B the children completed all four days of the non-branded sessions first, and then the four days of branded sessions after. In the activity packs, before every day’s activities there was a safety page which reminded the parents and children to warm up properly and make sure that the area they were using was safe; this was the same for both groups. Children were encouraged to complete the activities with whoever they were in ‘lockdown’ with.

![Figure 1](example_activity_pack_pages.png)

2.4 Measures

Due to the study being conducted in ecologically valid settings with parents and children using resources to support PA as intended, it was considered difficult to capture measures during activities without disrupting the activities as they are intended. Thus, post activity measures were used.
Immediately after each day’s activity session the children were asked to answer three questions in relation to their feeling of activation, valence, and perceived effort. These were included in the activity packs. Valence was measured through the Children’s Feeling Scale (CFS) and activation through the Children’s Felt Arousal Scale (CFAS) which were adapted for children from the adults versions by Hulley et al. [30]. Children were also asked to report perception of effort as how hard they felt they were working on a simplified Borg scale [31].

Parents also answered questions about their children’s PA both before and after ‘lockdown’ imposed. These questions were adapted from Sport England’s Short Active Lives Survey for Children and Young People [21]. At the end of eight days in the activity packs there was also a space for parental comments, to provide some anecdotal qualitative feedback on their views of the activities.

2.5 Statistical analysis

The primary pre-registered analysis examined the main effect of ‘condition’ (branded or unbranded) upon the children’s post activity feeling, felt arousal, and rating of perceived effort scales. A linear mixed model was employed using the ‘lmer’ package [23] and ‘lmerTest’ in R (v3.6.1; R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/) to examine the fixed effect of condition with random intercepts by participant ID, and Maximum Likelihood Estimation. Each participant had four observations (four for each condition). Because of the recruitment strategy and design of the study multiple participants (children) came from within the same household and completed the activities under the same conditions. Thus, to account for potential clustering a hierarchical model with participant ID nested within household was employed. The models for each dependent variable (dv) were: lmer(dv ~ condition + (1 | household / participant ID). Estimated marginal means with 95% confidence intervals were produced using the “emmeans” package in addition to pairwise contrasts. Contrasts were performed with an equivalence testing approach and 90% confidence intervals. Two sets of equivalence bands were used based upon the observed (i.e. based upon prior research [29]; dz = (0.376) to (0.517) for feeling scale and felt arousal scale respectively), and conservative fixed effect sizes (the observed effect sizes halved) used in the sample estimations. We originally noted in our pre-registration that the lower effect size out of the feeling scale and felt arousal scale would be used for the rating of perceived effort scale; however, we opted to average the effect sizes instead and used those in the same ‘observed’ (i.e. (0.376 + 0.517) / 2 = 0.446) and ‘conservative’ (the ‘observed’ halved), the lower effect used for rating of perceived exertion. All tests of main effects by condition were conducted with an α = 0.017 corrected for multiple comparisons given the three dependent variables. In addition, data visualisation included plotting individual raw data and estimated marginal means for repeated measures between condition, in addition to pairwise contrasts with both 95% and 90% confidence intervals and equivalence bands. Standardised effect sizes were calculated as Cohen’s $d$ [24] and interpreted using Cohen’s thresholds ($>0.2$ to $<0.5$ ‘small’; $>0.5$ to $<0.8$ ‘moderate’; $>0.8$ ‘large’) using the eff_size() function in the emmeans package. Additional analysis included visual inspection of affect within the circumplex model [27-28] and across time (i.e. from session 1-4) within each condition. Exploratory analysis was originally intended to be conducted based upon the categorisation of PA levels from the parents reports of their children’s daily PA in minutes before ‘lockdown’ (<30 minutes = Less Active; 30 to 59 minutes = Fairly Active; >60 minutes = Active). However, no children were classified as ‘Less Active’ so we opted to instead include ‘PA minutes’ as a fixed continuous covariate in the exploratory model and examine its interaction with condition i.e. lmer(dv ~ condition * PA minutes + (1 | household / participant ID). Interaction plots were produced from the lmer model using the ‘interactions’ package. Descriptive statistics for PA before and after ‘lockdown’ were also considered. Further, anecdotal qualitative
feedback from parents was examined and together considered with the results of quantitative analyses.

3.0 RESULTS

3.1 Physical activity before and during ‘lockdown’

Table 1 presents descriptive data regarding parents reports about their child’s normal PA levels from before and after ‘lockdown’ (note, responses regarding types of activity are not presented but available in the online files [https://osf.io/f7dpx/files/](https://osf.io/f7dpx/files/)). There were decreases from before to after ‘lockdown’ in the proportion reported as ‘very active’ and increases in both those reported as ‘active’ and ‘not very active’. However, the reported time spent being active did not differ much between before and after ‘lockdown’ and on average suggested that recommendations for 60 minutes of PA per day were being met. There was a considerable change in the proportion reported to be utilising online resources for PA from before to after ‘lockdown’, though the proportions of those engaging in PA inside or outside of their homes did not change.

<table>
<thead>
<tr>
<th>Table 1: Physical Activity Questionnaire Data</th>
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<tbody>
<tr>
<td><strong>Variable:</strong></td>
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<tr>
<td>How would you rate their physical activity levels?</td>
</tr>
<tr>
<td>Very Active</td>
</tr>
<tr>
<td>Active</td>
</tr>
<tr>
<td>Not very active</td>
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<tr>
<td>In the last 7 days has your child exercised inside?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
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<tr>
<td>In the last 7 days has your child exercised outside?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
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<tr>
<td>Does your child usually exercise using online resources e.g. videos?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>How much time did your children usually spend doing sport, fitness activity (such as gym or fitness classes), dance, or play on each day they did the activity? (mean±SD in minutes)</td>
</tr>
<tr>
<td><strong>Before Lockdown:</strong></td>
</tr>
<tr>
<td>68±32</td>
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</table>

3.2 Activation, Valence, and Perceived Effort results

Valence
Figure 2 shows the paired comparisons for valence measured using the CFS in the raw units for both the branded and unbranded sessions (A), the paired difference between conditions in the raw units (B), and the paired difference expressed as Cohen’s $d$ in addition to observed (blue) and conservative (red) equivalence bands (C). There was no statistically significant main effect of ‘condition’ found in the linear mixed model for valence ($F_{(1,224)}$ = 1.509, $p$ = 0.221) with similar estimates for both branded (2.71 [95%CIs 2.25 to 3.18]) and non-branded activities (2.96 [95%CIs 2.49 to 3.43]). Cohen’s $d$ for the between condition contrast was trivial (-0.154 [95%CIs -0.411 to 0.103]). The equivalence test against the effect size observed from prior data [29] was statistically significant suggesting equivalence between the branded and non-branded sessions at this level ($t_{(35.1)}$ = -2.871, $p$ = 0.0034). Equivalence testing against the conservative bands was not significant ($t_{(35.1)}$ = -0.829, $p$ = 0.2064). Visual inspection of Figure 2A reveals considerable variability both between and within individuals in valence. Further, Figure 2C highlights that, while it is possible to infer equivalence between conditions using the previously observed effect size, the estimate is insufficiently precise to infer equivalence at the more conservative level.

Figure 2. Feeling Scale. A: Paired individual responses and estimated marginal means [grey bands = 95%CIs] in raw units for branded (B) and non-branded (NB) conditions (note: each pair represents the same session number or time within each condition i.e. session 1 B and session 1 NB, session 2 B and session 2 NB etc.). B: Pairwise individual comparisons and estimated marginal mean [grey band = 95%CIs; black bars = 90%CIs] for comparison (i.e B minus NB) in raw units between conditions. C: Pairwise comparison estimated marginal mean [grey band = 95%CIs; black bars = 90%CIs] for comparison (i.e B minus NB) as Cohen’s $d$ between conditions with equivalence bands (dashed blue line = observed effect size; dashed red line = conservative effect size).
Activation

Figure 3 shows the paired comparisons for arousal measured using the CFAS in the raw units for both the branded and unbranded sessions (A), the paired difference between conditions in the raw units (B), and the paired difference expressed as Cohen’s $d$ in addition to observed (blue) and conservative (red) equivalence bands (C). There was no statistically significant main effect of ‘condition’ found in the linear mixed model for arousal ($F_{(1,233.94)} = 0.816, p = 0.367$) with similar estimates for both branded (4.62 [95%CIs 4.29 to 4.95]) and non-branded activities (4.74 [95%CIs 4.40 to 5.07]). Cohen’s $d$ for the between condition contrast was trivial (-0.113 [95%CIs -0.369 to 0.144]). The equivalence test against the effect size observed from prior data [29] was not statistically significant ($t_{(32.8)} = -2.088, p = 0.022$) nor when testing against the conservative bands ($t_{(32.8)} = -0.596, p = 0.278$). Visual inspection of Figure 3A reveals considerable variability both between and within individuals in arousal. Further, Figure 3C highlights that, while tests to infer equivalence between conditions using the previously observed effect size just shy of our adjusted alpha ($p = 0.017$), the estimate appears similar to that observed for valence. However, again the precision of the estimates was insufficient to infer equivalence at the more conservative level.

Figure 3. Felt Arousal Scale. A: Paired individual responses and estimated marginal means [grey bands = 95%CIs] in raw units for branded (B) and non-branded (NB) conditions (note: each pair represents the same session number or time within each condition i.e. session 1 B and session 1 NB, session 2 B and session 2 NB etc.). B: Pairwise individual comparisons and estimated marginal mean [grey band = 95%CIs; black bars = 90%CIs] for comparison (i.e B minus NB) in raw units between conditions. C: Pairwise comparison estimated marginal mean [grey band = 95%CIs; black bars = 90%CIs] for comparison (i.e B minus NB) as Cohen’s $d$ between conditions with equivalence bands (dashed blue line = observed effect size; dashed red line = conservative effect size).
Perceived Effort

Figure 4 shows the paired comparisons for perceived effort measured using a children’s version of the Borg Rating of Perceived Effort Scale in the raw units for both the branded and unbranded sessions (A), the paired difference between conditions in the raw units (B), and the paired difference expressed as Cohen’s $d$ in addition to observed (blue) and conservative (red) equivalence bands (C). There was no statistically significant main effect of ‘condition’ found in the linear mixed model for perceived effort ($F(1,224) = 5.209, p = 0.0235$) with similar estimates for both branded (4.74 [95%CI 4.22 to 5.26]) and non-branded activities (4.28 [95%CI 3.76 to 4.80]). Cohen’s $d$ for the between condition contrast was small (0.285 [95%CI 0.020 to 0.550]). The equivalence test against the effect size observed from prior data [29] was not statistically significant ($t(30.7) = -1.243, p = 0.1116$) nor when testing against the conservative bands ($t(30.7) = 0.476, p = 0.6814$). Visual inspection of Figure 4A reveals considerable variability both between and within individuals in perceived effort. Further, Figure 4C highlights that, though the 95%CIs exclude zero our tests using an adjusted alpha ($p = 0.017$) did not exclude this. Also, precision of the estimates was insufficient to infer equivalence at either equivalence level.

Figure 4. Rating of Perceived Effort Scale. A: Paired individual responses and estimated marginal means [grey bands = 95%CI] in raw units for branded (B) and non-branded (NB) conditions (note: each pair represents the same session number or time within each condition i.e. session 1 B and session 1 NB, session 2 B and session 2 NB etc.). B: Pairwise individual comparisons and estimated marginal mean [grey band = 95%CI; black bars = 90%CI] for comparison (i.e B minus NB) in raw units between conditions. C: Pairwise comparison estimated marginal mean [grey band = 95%CI; black bars = 90%CI] for comparison (i.e B minus NB) as Cohen’s $d$ between conditions with equivalence bands (dashed blue line = observed effect size; dashed red line = conservative effect size).
Circumplex Affect

Valence and arousal were also considered through the circumplex model of affect. A quadrant plot is shown in figure 5 with mean responses of valence and arousal for each of the four session within each condition. Typical emotions associated with different coordinates of valence and arousal in circumplex space are included to aid interpretation (though it should be noted that we did not explicitly collect data regarding these emotions from our sample of participants; they are merely there for illustrative purposes). The mean responses appeared to inhabit a similar space on the plot representative of ‘excitement’ and ‘elation’ between conditions and across sessions with only slight increases in valence noted.

![Circumplex Affect Diagram](image)

Figure 5. Quadrant plot of mean (red = branded; blue = non-branded) valence and arousal in circumplex space. Arrows indicate the direction of time within conditions from session 1 to 2, 2 to 3, and 3 to 4. The labels of emotions are for illustrative purposes (i.e. they were not measured explicitly in this sample and mapped to the circumplex space) and are taken from Posner, Russell, and Peterson (2005) [28].

Effect of Daily Physical Activity Levels Before ‘Lockdown’

When daily PA levels (minutes) before ‘lockdown’ was included as a continuous covariate exploratory analysis suggested little effect upon valence ($\beta = 0.009, p = 0.1289$), arousal ($\beta = 0.005, p = 0.211$), or perceived effort ($\beta = -0.014, p = 0.0582$). There were no clear interaction effects either for arousal ($\beta = -0.0008, p = 0.837$) and perceived effort ($\beta = 0.002, p = 0.7138$). Arousal was greater in both conditions for those with higher PA levels though the effects appeared small across the range of fitted values (~0.75 pts for the main effect), and perceived effort was higher for those with lower PA levels though again effects were small (~2.1 pts for the main effect). However, for valence, slopes appeared contrasting for either condition suggesting an interaction ($\beta = -0.013, p = 0.0519$); but differences in raw units were again minimal even at the extremes of fitted values (ranging ~1 pt). Figure 6 shows the interaction plots for condition and daily PA levels (minutes) before ‘lockdown’.
Figure 6. Interaction plots of fitted values (with 95% confidence interval ribbons from linear mixed model) for condition (red = branded; blue = non-branded) across daily physical activity levels (minutes) before 'lockdown' for: (A) valence, (B) arousal, and (C) perceived effort. Note: a random jitter is applied to individual data points.

3.3 Anecdotal Qualitative Feedback from Parents

Fourteen parents provided written feedback on their views at the end of the eight-days including both conditions. Thirteen of these related to the branding, with the majority of the comments remarking on the perceived positive influence of the branded sessions. Positive comments included “the branded ones were more enjoyable, she tried harder on those days”, “he definitely found the Disney ones more engaging”, “the use of characters was useful, they enjoyed having specific roles to play”, and “I didn’t think she realised she was exercising, she really enjoyed the games”. Also, parents commented on how “the Disney themed helped and went down well”. Two parents commented on the age of the children and how this effected the perceived influence of the branding; one commented “at 9 some of the characters were a bit old for him” and another “they weren’t familiar with the characters and would have been better aimed at younger kids”. Interestingly, one parents commented that it didn’t matter if there was a specific Disney character or not because “the key was we did it together which he enjoyed, and that it was all about imagination, when he could use that he was a lot more engaged and interested in the activity”. The final two types of comments related specifically to the current ‘lockdown’ situation; one parent commented how their child really enjoyed the activities but they “would have been more fun if there were other children obviously circumstances have not allowed that during lockdown. Only child”, and another parent commented on their children’s mental health due to the ‘lockdown’ noting “the girls have been up and down with their mental health over ‘lockdown’ and some days they did not want to do the activities at all”.
4.0 DISCUSSION

This study investigated the effect of Disney characters and branding upon children’s post activity affective responses and perception of effort through the implementation of the Change4Life Disney branded 10-minute shake ups and the effect of ‘lockdown’ resultant from the Coronavirus (COVID-19) pandemic on children’s PA. Congruent with findings from Sport England (2019) [21] our sample also showed a reduction in reported PA levels as a result of ‘lockdown’; 56% of parents reported their children were less active. This effect is not limited to the UK, worldwide there have been lockdowns imposed and worldwide children are struggling to meet their PA needs. Research from South Korea surveyed parents between the 27th-31st March 2020 and found that 81% stated their child’s screen time had increased, and 94% said that their child’s free play and use of sports facilities had decreased [32]. This is also the case in Italy where children’s time spent in sport activities was reported to have decreased by 2.3±4.6 hours per week, and screen time increase by 4.84±2.4 hours per day [19]. Although, while parents apparently perceived their children to be less active when reporting categorically (“Very Active”, “Active”, “Not Very Active”), it should be noted that PA levels reported as daily minutes suggested only a small drop on average and that children in this sample were still meeting recommendations. The health benefits of PA for children are well evidenced [36]. Children typically complete their daily PA through active travel to school, physical education classes and play time, organised sports clubs, active play and spending time in playgrounds and parks [32]. With ‘lockdown’ rules in place there has been an impact on a child’s ability to be active through traditional pathways, but alternative options appear to be displacing these to help support and maintain PA.

There has been a shift towards using online resources to stay active; indeed, using electronic media to facilitate participation has been a primary recommendation for promoting healthy movement behaviour during the ‘lockdown’ [25]. An example of this is the popularity of the Joe Wicks home workout videos which have been a phenomenon during the ‘lockdown’ [26]. This shift is also clearly demonstrated by the results of this study, whereby before the ‘lockdown’ no children were reported to be using online resources for their PA; however, after ‘lockdown’ 78% were. Clearly online resources have a place in promoting PA during ‘lockdown’, and the Change4Life resources are an apt example. The online resources used in this study likely helped to increase engagement in PA alongside use of other resources; indeed, support for the 10-minute shake ups resources was evidenced by many of the parental comments.

Despite the support for the resources, there was no clear effects of the Disney branding for the 10-minute shake ups resources specifically when considering children’s post activity valence, arousal and perceived effort responses. In fact, both sessions appeared to produce largely equivalent effects. As noted, there is thought to be a bidirectional relationship between affective responses to PA and future engagement in PA [7,8]. We anticipated that the Disney branded sessions would result in a more positive affective experience based on the impact that characters can have on children [14-18]. However, a limitation to the our study, as a result of it being conducted in ecologically valid, it was considered difficult to capture measures during activities without causing disruption. Prior research has shown that there might be a ‘rebound’ effect whereby, even when affective responses differ during activity, post activity responses can return to baseline levels potentially masking any differences between conditions. Thus, the children in this sample may have differed in their affect between conditions during the activities, yet the ratings provided immediately post did not reflect this. However, prior research in adolescents typically shows that it takes some time for affective rebounding to occur (>5 minutes) and that even immediately post exercise there are still differences evident, at least when comparing differing intensities of effort for activities; [25]. This seems to be the case even when comparing between groups with different habitual PA levels [26] and our analysis
did not reveal any clear effects of PA levels prior to ‘lockdown’ either. Thus, our results which reflect affective responses immediately post activity may still suggest that there was no difference during activities between conditions. Nevertheless, when considering the results of the affect in circumplex space, children appeared to be ‘excited’ during both conditions, which shows that despite the conditions children experiences positive affective responses towards PA, which is positive, and there was also moderate perceptions of effort. This is similar to prior results comparing traditional physical activities (extracurricular sport) with novel ‘fun’ activities (trampoline park sessions); children showed similar affective responses (and similar to those reported here) for both activities [29]. While it is not clear whether the lack of between condition differences in affect is a result of our study design and post activity measurement, or whether it truly reflects that children responded similarly while performing activities irrespective of branding, the qualitative feedback from parents suggests some preference for the branded activities.

Anecdotal qualitative feedback from the parents extended in particular to the Disney branded activities; for example, one parent reported their child “…found the Disney ones more engaging”. Another comment from a parent was that the “branded ones were more enjoyable, she tried harder on those days”. When the sessions had the additions of a narrative and characters the parents perceived their children tried harder and enjoyed the sessions more. This might reflect the perceived effort where was a small effect in favour of the branded sessions; though as noted this was small, non-significant with our adjusted alpha, and the estimate was insufficiently precise to infer equivalence. Another parent commented “I didn’t think she realised she was exercising”. This comment is of particular interest as it demonstrates well the research around entertainment education. Entertainment education is a popular strategy for incorporating health and educational messages into popular media with the goal of positively influencing awareness, knowledge, attitudes, and/or behaviours [33]. Two main areas of interest around this are the use of a narrative and characters. Narrative involvement involves the viewer being engaged in the story line rather than in their immediate environment and as such they experience the vicarious cognitive and emotional responses to the narrative as it develops [33]. Secondly with the use of characters, similarly the viewer forgets about their own reality and temporarily becomes the characters taking on their perspective [34]. Many entertainment education approaches employ a narrative structure whereby they lead a child through a story resulting in the child feeling swept up and developing an interest in following the events [33]. Children take on the role of the characters in the story as the child is engrossed in the narrative; forgetting the reality surrounding them, they take on the perspective of the character [22]. Parents in this study reported that when they completed the Disney branded Change4Life sessions they found the addition of the characters useful and that the children “enjoyed having specific roles to play”. This perhaps evidences the theory in practice; the Change4Life 10-minutes shake ups using Disney branding provide a level of immersion, gave the children participating a role to play, and both of these elements helped to increase the engagement and enjoyment.

However, in addition to these positive comments there were also some comments regarding the negative impact of ‘lockdown’. One parent commented that their children’s “mental health has been up and down” during ‘lockdown’ and that “some days they did not want to do the activities at all”. As noted, there was considerable variation in valence, arousal, and perceived effort both between and within children. Such day to day variation in children’s mental health and wellbeing likely influenced this

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1 Indeed, this variation appears to be a general phenomenon at least in children. We noted similarly low intraclass correlation coefficients (ICC) from the models for valence (adjusted ICC = 0.210; conditional ICC = 0.209) and arousal (adjusted ICC = 0.219; conditional ICC = 0.219) in this study, as to those of a previous study [29] in children using repeated trials (for valence, adjusted ICC = 0.374; conditional ICC = 0.359; for arousal, adjusted ICC = 0.274; conditional ICC = 0.267)). In adults ICC has for
and potentially masked any small positive effects of the branding on these measures. Although, for
valence in particular, responses were typically positive reiterating that children generally appear to
have positive affective experiences doing the activities in either condition. This is a really important
point to emphasise in the situation under which this study was conducted; the ‘lockdown’ imposed
life changing circumstances for everyone, including children. The effects have been far reaching, and
include mental health impacts. The relationship between mental health and PA is well established
[35] and therefore a reduction in PA levels is expected to have a negative effect on mental health;
notwithstanding the additional worry and anxiety that comes with experiencing a worldwide health
pandemic. The usual approaches to engaging in PA that might help in coping with these life changing
circumstances have been compromised as a result of ‘lockdown’. But this is where home based (or
garden based) PA programs, including those facilitated by online resources such as those produced
by Change4Life, are perfectly placed to help.

Limitation and future research

One limitation of the study is that, due to the nature of data collection, the actual intensity of effort of
activities was unknown. While not significant, it seems that the perceived effort could be slightly
higher for the branded sessions but the affective scores were lower. Previous research has suggested
the as the intensity of the PA increases this results in a decline in affect2 [37] therefore this relationship
should be investigated further. Lastly, though our sample size was more than adequate to power the
study to detect previously observed effect sizes, we fell short of that required for the more
conservative effects. However, given the differences in raw units observed here it seems unlikely that
such conservative effects are very meaningful even if they were detectable.

5.0 CONCLUSION

This research had two main emphasis, to look at the effect that the Disney branded 10-minute shake
ups created by Change4Life had on children’s affective responses and perceived effort, and to
investigate the effect of ‘lockdown’ on children’s PA. In terms of the effect of the ‘lockdown’ on
children’s PA levels, 56% of the children in this study were reported by their parents to have been
completing less PA than before ‘lockdown’ Although, PA levels suggested only a small drop on
average and that children in this sample were still meeting recommendations. However, with
‘lockdown’ traditional pathways to PA have been affected and alternative options such as online
resources appear to be displacing these to help maintain PA. This shift to online resources made the
Disney branded Change4Life 10-minute shake ups a perfect tool to help children stay active during
this time. It also allowed an insight into the effect of using characters, and the narratives on children’s
PA. Though our results suggested little difference between conditions on affect and perceived effort,
children generally reported positive post activity affective responses. In contrast though, the branded
sessions were supported by parental comments which suggested that children enjoyed them more,
and tried harder during the activities. The use of immersive elements such as characters and narrative
in PA sessions appears potentially promising.

valence measured with the feeling scale is typically higher (adjusted ICC = 0.60; conditional ICC = 0.72; [38]). Interaction plots
by individual participants are also included in the online materials (https://osf.io/smxn4/).
2 Indeed, in a further exploratory analysis we examined inclusion of perceived effort as a covariate upon valence (β = -0.2056, p
= 0.0102) which showed this relationship, but was weaker with arousal (β = -0.0744, p = 0.1260) and there were no clear
interaction effects with condition. It is noteworthy that even at higher perceived efforts valence was generally positive
suggesting minimal impact; the main effect ranged ~2 pts. An interaction plot for this exploratory analysis is available in the
online materials (https://osf.io/juarv/).
6.0 REFERENCES


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