

AMENDED Exhibit 774

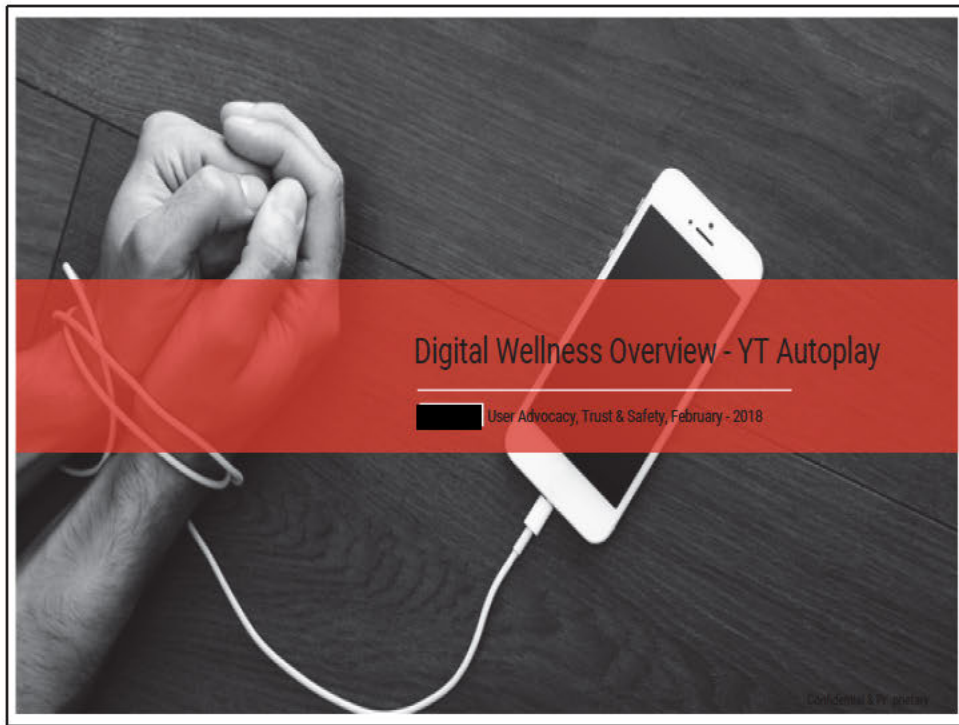
PLAINTIFFS' OMNIBUS OPPOSITION TO DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

Case No.: 4:22-md-03047-YGR

MDL No. 3047

In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation

Produced in Native



Technology Addiction

Tech addiction is primarily defined as widespread obsession, compulsive and excessive use of technology that interferes with Daily Life.

Research exists that indicates that prevalence of [tech addiction](#) is inversely related to quality of life.

Tech Addiction is not new, but it has exploded in the digital age and Google's role in enabling it is being questioned in public discourse.

For stories about tech addiction from across the globe - click [here](#)

YOUR HEALTH

Smartphone Detox: How To Power Down In A Wired World

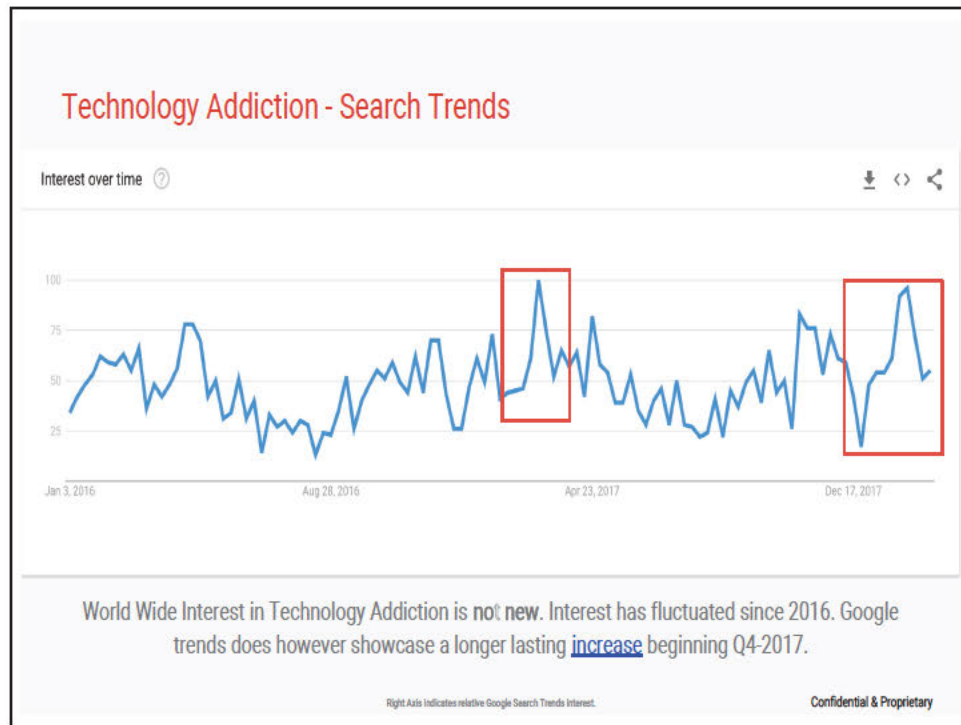
Former Facebook and Google workers launch campaign to fight tech addiction

Campaign to highlights potential harm of digital platforms and social media on young people, alongside a call to regulate tech companies

"This compulsive pattern does not reflect a casual interest, but rather consists of a driven pattern of use that can frequently escalate to negatively impact our lives. The key life-areas that seem to be impacted are marriages and [relationships](#), employment, health, and legal/financial status."

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Tech addiction and Google's role has been making the news and has gained prominence since "time well spent" movement started.



Validating the point that tech addiction is not new, we see that interest in Tech addiction has ebbed and flowed through 2016 and 2017. The most recent spike though has been the most prominent.

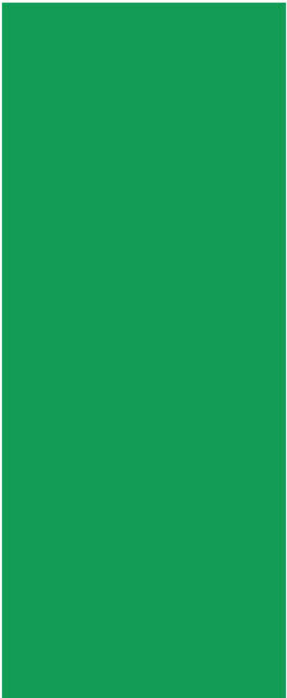
Technology Addiction Trends

On an average, the Google Search Index receives ~4.6K queries on tech addiction everyday - from the US alone.

The US, Australia, Canada, the UK, India, South Korea, Turkey, Iran, Brazil and the Philippines are countries that lead with respect to interest in technology addiction.

Search Query	Weekly Queries
tech addiction	4207
technology addiction	4062
addiction to technology	598
addicted to technology	469
tech addiction rehab	384
katie couric tech addiction	361
art about technology addiction	338
technology addiction cartoon	296
south korea technology addiction	210
children addicted to technology	189





Google Products & Tech Addiction

- Compulsive Content Consumption
 - YT Autoplay
 - Google News Feed
- Fear of Missing Out
 - Push notifications
- Immersive Engagement
 - Mobile Gaming and Micropayments

Overarching Goal: This research compendium should aid Google's external messaging on tech addiction and inform Product decisions.

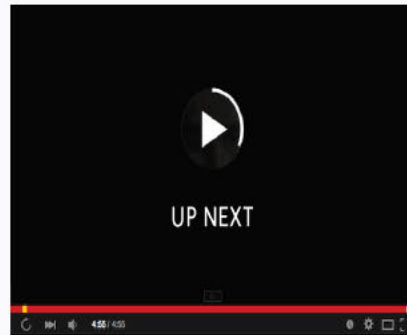
The above overlap between Google and Tech Addiction is not comprehensive. These overlaps could be new areas of research or lines of enquiry. This deck however, will focus on YT-Autoplay.

Google & Tech Addiction

At the center of the discussion is YouTube's **Autoplay** feature: Articles suggest that YT & google increasingly rely on Autoplay for engagement

Profitable Attention

From humanetech.com - "As content grows exponentially, platform companies rely increasingly on automation: YouTube automates billions of videos to play next for 1.5 billion users. We can't expect attention-extraction companies like YouTube, Facebook, Snapchat, or Twitter to change, because it's against their business model."



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Google & Tech Addiction

Autoplay is also cited as encouraging following 2 behaviors

Being non-neutral to drive engagement



From humanetech.com - YouTube **automates** billions of videos **to play next** for 1.5 billion users. These non-neutral products segregates us into echo chambers, fragmenting our communities.



Disrupting Sleep Patterns



From humanetech.com - "YouTube **autoplay**s the next video within seconds, even if it eats into our **sleep**. These are not neutral products. They are part of a system designed to addict us."

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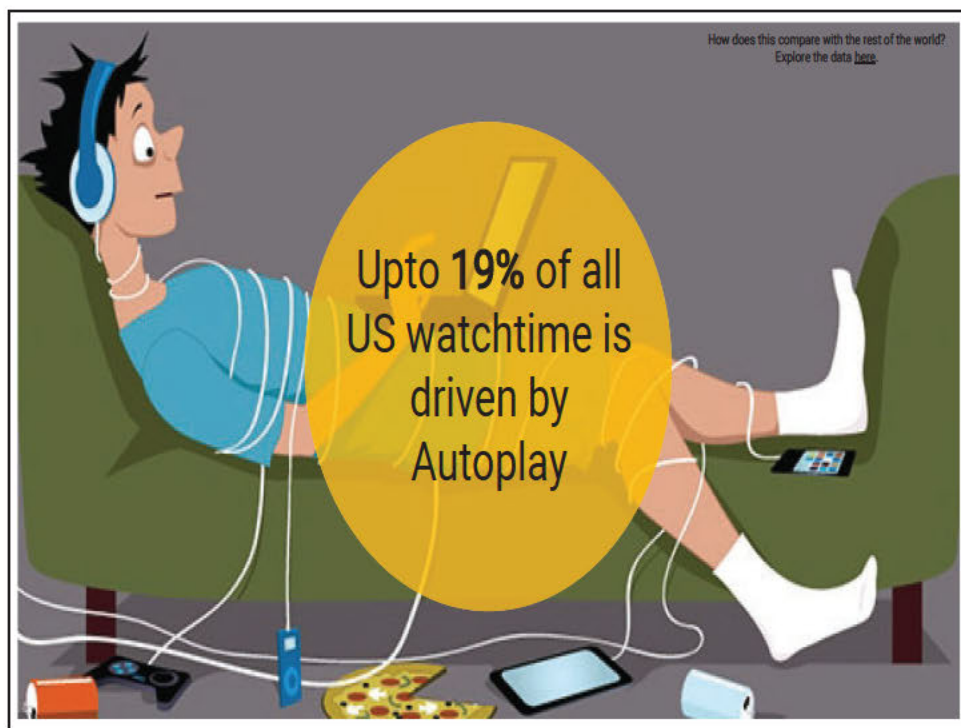
Let us test these three claims

Claim 1: YT increasingly relies on Autoplay for exponential growth

Claim 2: Autoplay disrupts sleep patterns

Claim 3: YT Autoplay is non-neutral and creates filter bubbles to keep users engaged

Claim one: YT increasingly relies on Autoplay
for exponential growth



How much watchtime is actually attributed to Auto-play? How does this compare with the rest of the world. Average is 16% Median is 17%. Latin American Countries top the charts with Greater than 25%, US and Europe around 19 - 18%, Subcontinent and Middle East (Israel Exception) have some of the lowest rates - 7-8% . Hypothesis - Generally, we do see autoplay rates correlate to access and infrastructure maturity

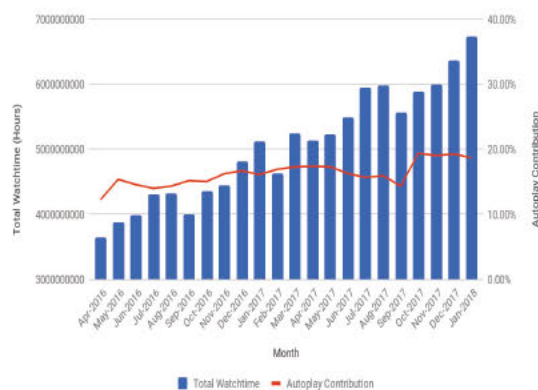
YT growth has been largely organic and not driven solely by auto-play

Autoplay is not the
primary driver of
engagement or revenue

Autoplay contribution to Watchtime has remained
stable since 2016. (~16% - 19% of total watch time).
Users largely do exercise choice and discretion.

Watchtime here is used as a proxy for revenue

Monthly Trend of Regular and Autoplay Watchtime (US)

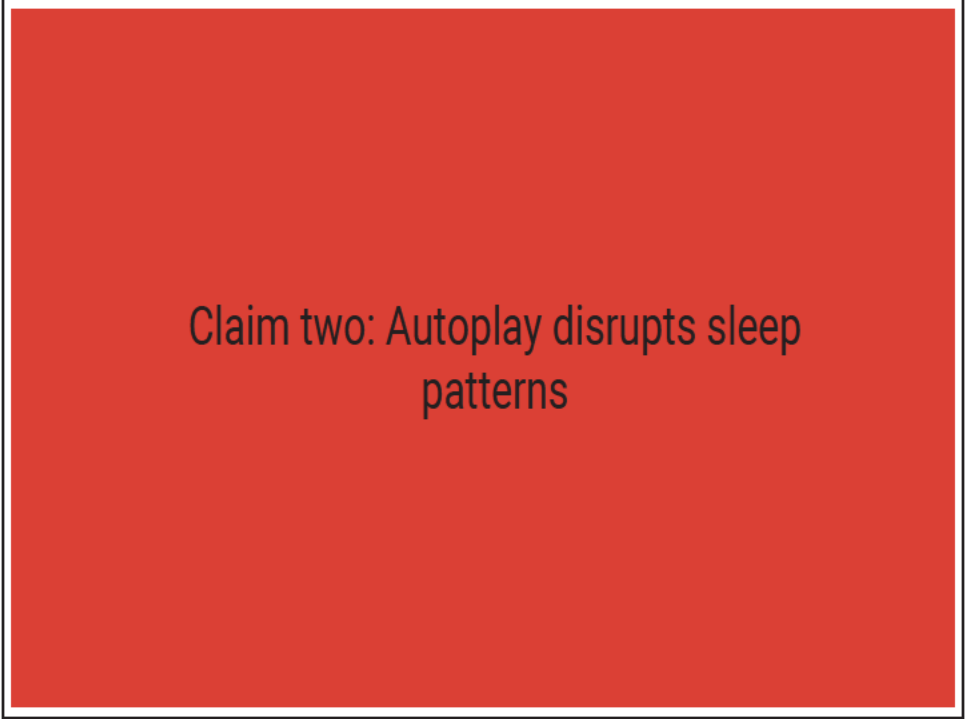


Please note: Watchtime here is "de-spammed watchtime". This means that watchtime is only recorded when user presence is determined. Therefore spam watchtime and situations where videos play in a different tab (music playlists) or situations where videos play with no one in a room are discounted.

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Monthly Watchtime in the US doubled from April 2016 to Jan 2018 (From 3.6 Billion Hours to 6.7 Billion Hours). However Autoplay contribution has remained stable / increased slightly. To say we depend on auto-play to capture attention is not entirely accurate.

Verdict: YT growth has been largely organic
and not primarily driven by Autoplay



Claim two: Autoplay disrupts sleep
patterns

$$(CRB - (1-CRB)) / \sqrt{VISITORSB} / 2$$

0.000306

Std. Error of difference

$$SE_{\text{difference}} = (SEA2 + SEB2) / 2$$

0.000322

~ upto 12% of total watchtime occurs between 12 AM to 6AM

Weak effect Significance:

Conversion Rate Control

Conversions A / Visitors A

19.38%

Conversion Rate B

Conversions B / Visitors B

20.83%

Relative uplift in Conversion Rate

CRB - CRA / CRA

7.49%

Observed Power

100.00%

p value

0.0000

Z-score

$$(CRB - CRA) / SE_{\text{difference}}$$

56.7841

Standard error A

$$(CRA * (1-CRA)) / \sqrt{VISITORS A}$$

0.000131

Standard error B

$$(CRB * (1-CRB)) / \sqrt{VISITORS B}$$

0.000219

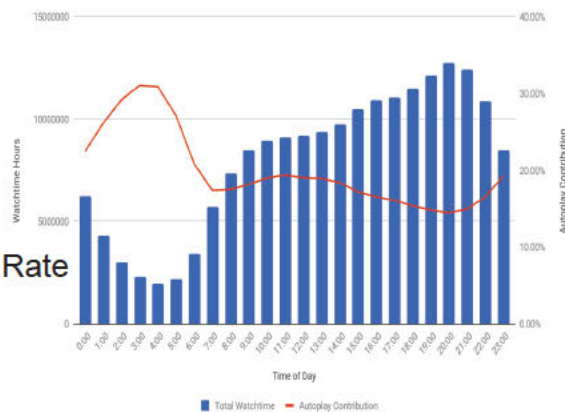
Std. Error of difference

$$SE_{\text{difference}} = (SEA2 + SEB2) / 2$$

0.000256

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YT Weekly Watchtime by Hour of Day (CA-US)



At its peak, Autoplay watchtime contribution doubles during the night

Autoplay contribution to Watchtime spikes between 7 AM and 10 AM and users in California spend up to 29M hours a week watching YT videos late into the night.

Disabling autoplay late into the night could potentially help in adding 1M hours in sleep time in California everyday!

Please note: Watchtime here is "de-spammed watchtime". This means that watchtime is only recorded when user presence is determined. Therefore spam watchtime and situations where videos play in a different tab (music playlists) or situations where videos play with no one in a room are discounted.

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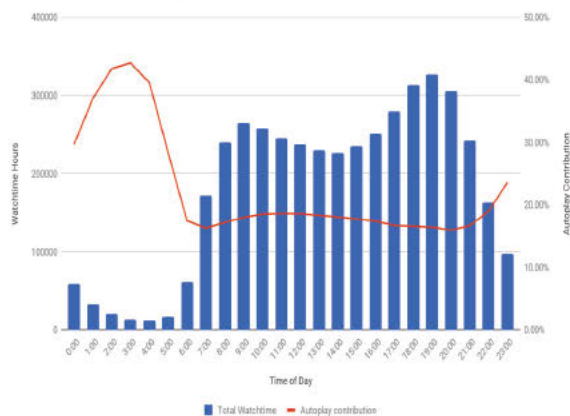
Autoplay driven watchtime at night is higher in the YT-Kids App

At its peak, Autoplay watchtime contribution triples during the night

Autoplay contribution to Watchtime spikes between 11 PM to 7 AM and kids in California spend up to **214K hours a week** watching YT videos late into the night.

Disabling autoplay late into the night could potentially help in adding **9K hours** in children's sleep time in California everyday!

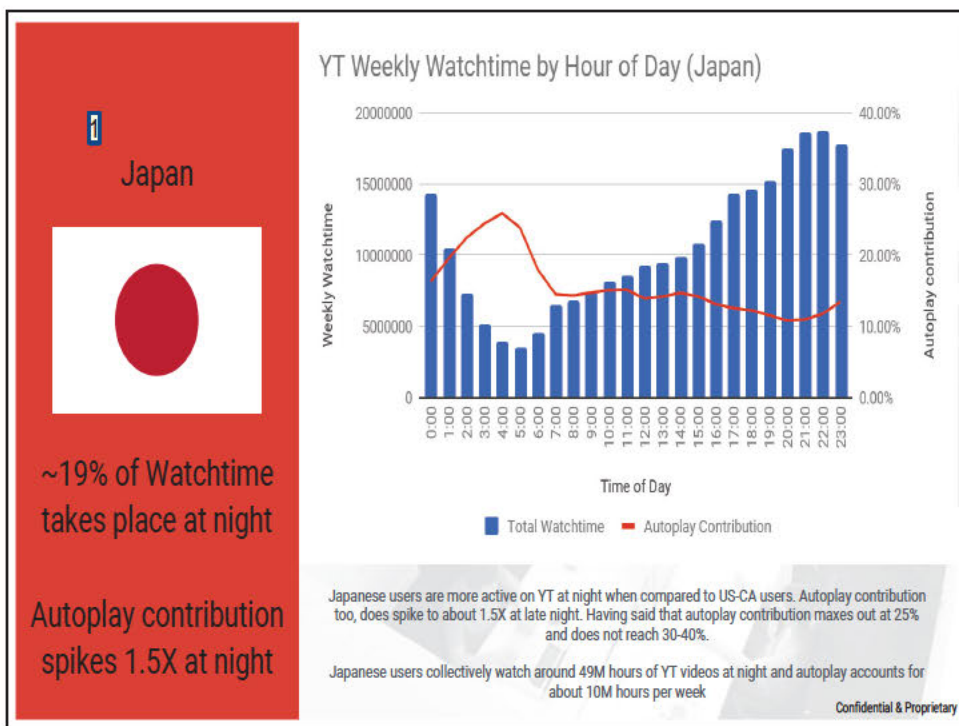
YT-Kids Weekly Watchtime by hour of Day (CA-US)



Please note: Watchtime here is "de-spammed watchtime". This means that watchtime is only recorded when user presence is determined. Therefore spam watchtime and situations where videos play in a different tab (music playlists) or situations where videos play with no one in a room are discounted.



How do these stats compare with
other countries?



Slide 1

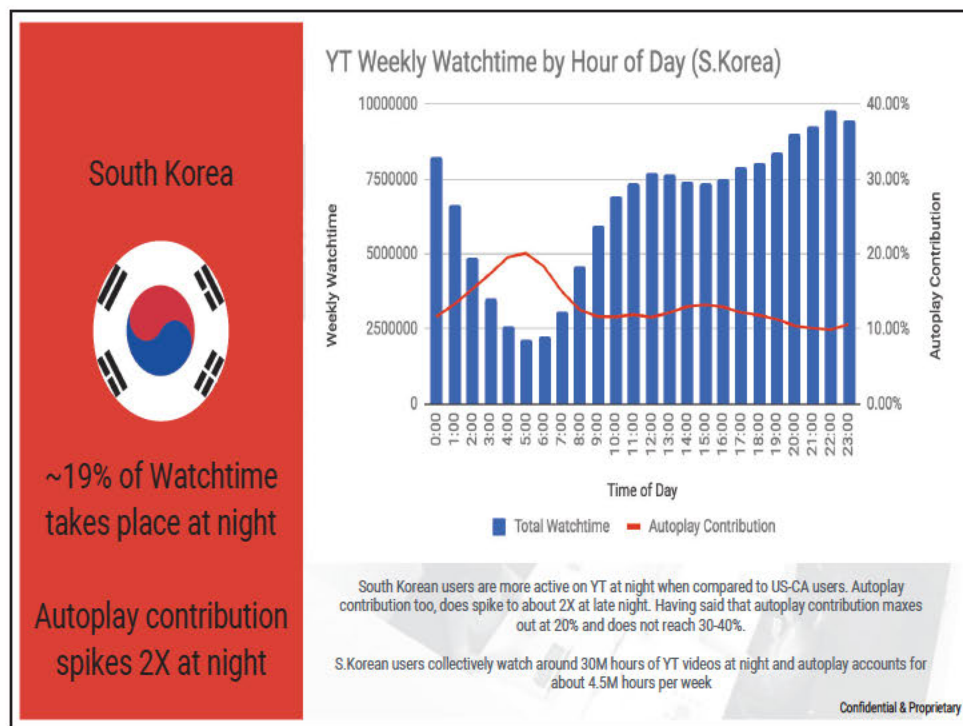
1 I'd suggest paring this slide down ALOT -- Way too much info.

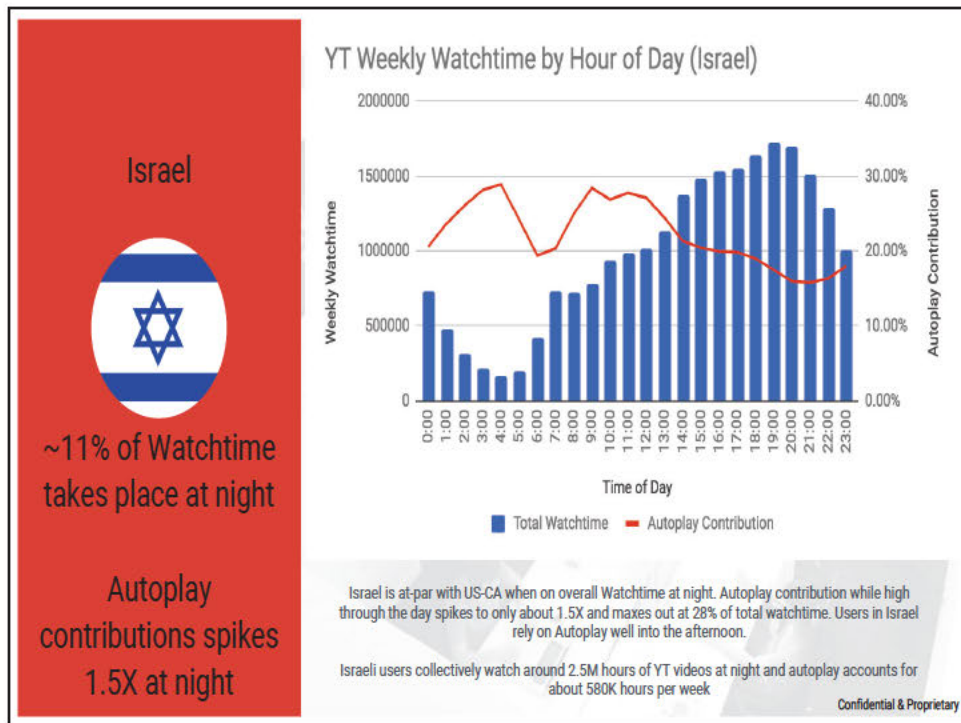
Maybe just show the difference

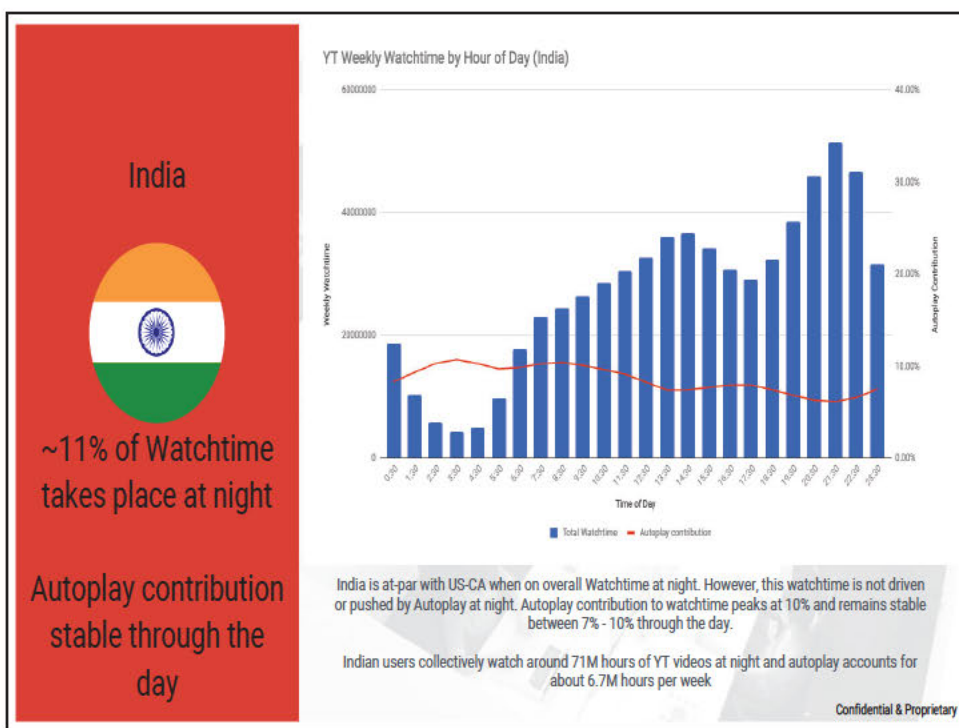
[REDACTED] 3/2/2018 7:23:26 AM

1 +1

[REDACTED] 3/2/2018 7:23:26 AM









An entire genre of memes that showcase YT and its influence on sleep exist - "One more video" memes.

Slide 1

1 Is Autoplay really the issue here, since even if Autoplay were off during the night it would account for less than half of the night hours watchtime?

Cristos Goodrow; 3/29/2018 9:01:15 AM

1 Hi Cristos. Thanks for the comment. Autoplay is certainly not the ONLY issue here. In-fact as you rightly stated even at the peak the feature only contributes to 30% - 40% of the watch-time. However given the increased effect of autoplay (uplift of 10-20%) during the night versus the day, it can potentially be *one* of the issues influencing the pattern showcased by the memes.

Through this slide we wanted to indicate the perception that is prevalent in popular culture.

3/29/2018 9:01:15 AM

Verdict: Autoplay could be potentially disrupting sleep patterns.

Disabling or limiting Autoplay during the night could result in sleep savings

Slide 1

- 1 How do we know this isn't just people leaving autoplay running unattended overnight?
- Other research suggests that active users don't report a lot of sleep pattern disruption:
<https://docs.google.com/...>
 3/29/2018 9:11:45 AM
- 2 Hi [REDACTED] Cases where people leave autoplay running unattended does do not get counted into the watch-time calculations - we plotted de-spammed watch-time. AFAIK, any activity post 75 mins after a last action (lact threshold) does not count as Watch-time. The watch-time in the graphs above therefore would be from interactive users as defined by go/user-presence
- Thanks for sharing the research. Will have a look.
 [REDACTED] 3/27/2018 5:52:46 AM
- 2 Understood that after 75 minutes there is a timeout. It would be interesting to see if the resume rates differ for overnight autoplay sessions vs. other times of day (suggesting that a higher % are unattended as of 75 minutes). Also, autoplay could be relatively more popular if people are more likely to be listening to music at night, which may actually help with sleep rather than hinder it.
 [REDACTED] 3/27/2018 4:31:23 PM
- 3 Thank you [REDACTED]. Great points on resume rate comparison. I'll add it into the next steps. Another enquiry that would help in shedding light here would be to pull out legos categories of videos watched during the night and the day. I'll try to add this as a next step as well.
- I do agree that music may help people sleep at night - however since this is interactive watch-time, it does mean that the screen will be active (mostly).
- There is extensive research that indicates that generally, light from LED screens (Blue wavelength light) is bad for sleep patterns -
 [REDACTED]
- I completely agree that topics such as sleep deprivation can be subjective and cannot be measured accurately unless deeper research is conducted with emphasis on individual users. (as

Slide 1 (continue)

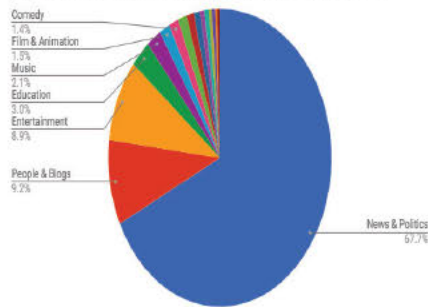
opposed to aggregate metrics).

[REDACTED]; 3/29/2018 9:11:45 AM

Claim: YT Autoplay is non-neutral and
creates filter bubbles to keep users
engaged

Autoplay does not keep users hooked to the same category all the time

Category of Autoplay videos served from "News & Politics"



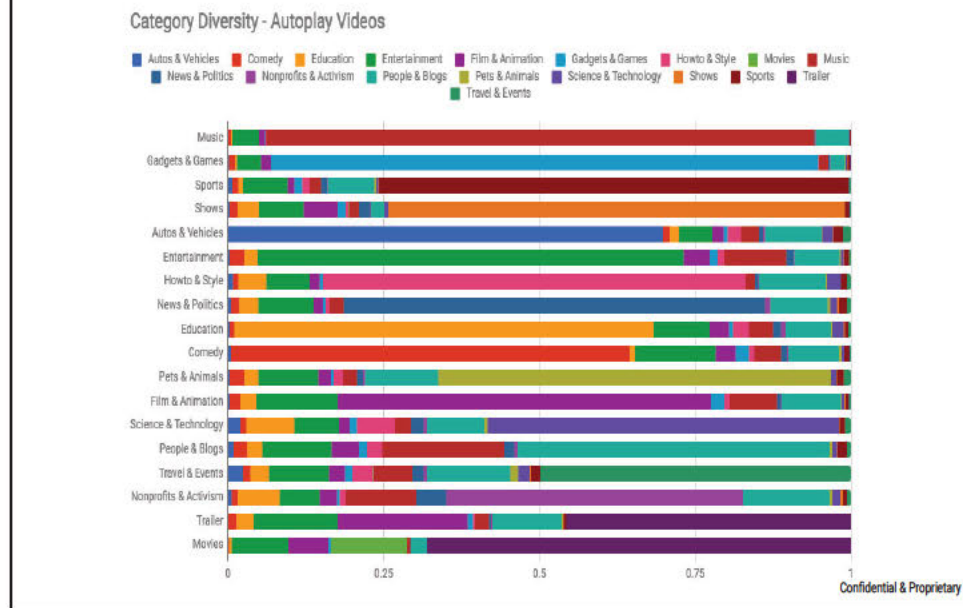
On an Average, **3 out of 10** autoplay suggestions will NOT be from the same category as the video currently being watched

Categories	Autoplay Category Match
Music	87.99%
Gadgets & Games	87.82%
Sports	75.34%
Shows	73.39%
Autos & Vehicles	69.84%
Entertainment	68.38%
Howto & Style	67.89%
News & Politics	67.72%
Education	67.29%
Comedy	64.13%
Pets & Animals	63.10%
Film & Animation	59.87%
Science & Technology	56.38%
People & Blogs	50.03%
Travel & Events	49.75%
Nonprofits & Activism	47.66%
Trailer	45.67%
Movies	12.20%

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The table showcases the percentage of the time Autoplay matches a user with a video from the same category. An interesting callout here is Movies. A YT video in the movies category is rarely followed by an autoplay video in the movies category. This kind of makes sense as users may not be predisposed to watch two movies back to back. The autoplay suggestions for movies is therefore predominantly "trailer"

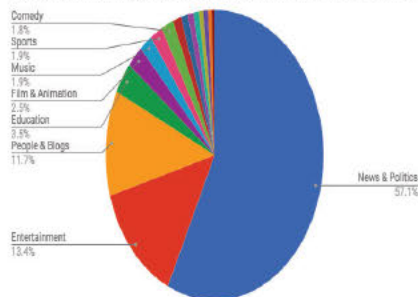
Autoplay does not keep users hooked to the same category all the time



The graph above is a 100% stacked chart which shows the diversity of autoplay videos in each category. Take the first row for example. The Music bar showcases that autoplay suggestions for videos in the music category would be predominantly music, entertainment and then people & blogs. This graph therefore does showcase that diversity exists in the autoplay suggestions.

Autoplay Category "stickiness" is not very different from organic behavior

Category of videos viewed after "News & Politics" (Organically)



On an Average, users choose to watch videos from different categories 4 out of 10 times.

Category	Organic Match	Autoplay Match
Gadgets & Games	76.77%	87.82%
Music	75.83%	87.99%
Sports	64.16%	75.34%
Entertainment	63.03%	68.38%
Autos & Vehicles	58.96%	69.84%
News & Politics	57.07%	67.72%
Howto & Style	54.71%	67.89%
Education	53.55%	67.29%
Shows	51.52%	73.39%
Pets & Animals	50.95%	63.10%
Comedy	50.67%	64.13%
Film & Animation	48.56%	59.87%
People & Blogs	46.64%	50.03%
Science & Technology	42.71%	56.38%
Travel & Events	35.34%	49.75%
Nonprofits & Activism	33.02%	47.66%
Trailer	25.91%	45.67%
Movies	17.75%	12.20%

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Verdict: YT Autoplay does have diversity in categories of videos suggested to users that mostly mirrors organic user behavior

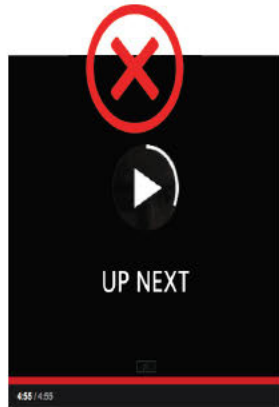
Findings Recap &
Recommendations

Google & Tech Addiction

Autoplay as primary driver of engagement

Status: FALSE

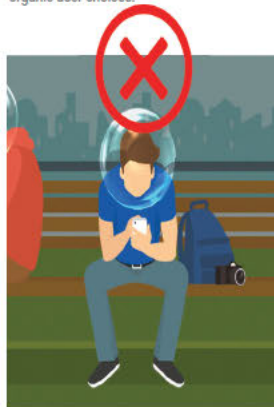
YT growth has been organic and not primarily driven by autoplay.



Autoplay creates filter bubbles for engagement

Status: FALSE

Autoplay category choices mostly mirror organic user choices.



Autoplay disrupts sleep patterns

Status: TRUE

Autoplay potentially disrupts sleep patterns. Autoplay contribution to daily watchtime increases significantly.



Slide 1

1

I'm not fond of the way we are approaching with this.

- Are there not opportunities to improve in all three areas?
- Even if we are already performing optimally with respect to e.g. filter bubbles, if we are perceived as a negative influence then we still get punished.

With that in mind I'm wondering if we might formulate recommendations in all/more areas, even if we think we are in good shape.

3/26/2018 3:58:24 PM

Recommendations

- Consider making Autoplay sensitive to local time and context so as to discourage destructive sleep habits
 - Make “default-on” autoplay at night optional
 - Regulate autoplay late at night
- Additional research: Conduct multi-day GAIA level research on other tech addiction topics
- Explore similar research avenues for other Google Products.