RAC Foundation

With support from:

roadsafetyanalysis

What is the impact on road safety when the clocks change for British Summer Time?

Russell Martin

October 2018

Introduction

Daylight saving time (DST) is the practice of temporarily adopting another time zone for summer by adjusting clocks at the start of summer and then changing them back when summer ends. DST operates in around 70 countries including most parts of North America and Europe.

The UK observes Greenwich Mean Time (GMT) in winter months but British Summer Time (BST) in the summer. BST begins at 01:00 GMT on the last Sunday in March, when clocks move forward one hour, meaning that 01:00 GMT and 02:00 BST are effectively the same moment. BST ends at 01:00 GMT on the last Sunday in October. The start and end times of DST have been synchronised across the European Union since October 1995.

The effect of DST is to make the mornings darker but the evenings lighter. The relative merits and impacts of DST have long been debated with calls both for a move to 'Double BST' – effectively adopting the same time as France and Germany – and for the abolition of DST – meaning the UK would operate on GMT all year round.

Part of the debate focuses on road safety, arguing that keeping BST throughout the winter months would reduce the number of personal injury collisions (PICs). This paper therefore examines the impact that changing from GMT to BST and back again has on road safety.

Methodology

The analysis in this paper is based on six years' worth of STATS19 accident data published by the Department for Transport, from 2012 to 2017 inclusive. It compares collision data for Great Britain for the two-week periods either side of each clock change.

The actual day on which the clock change occurs is termed 'Day 0' for the purposes of this paper. On March 'Day 0', the hour from 01:00-01:59 does not really 'exist'. In theory, there should be no collisions recorded during this hour, although, in practice, there are a small number within some years' data. Any such collisions have been excluded from the analysis on the basis that it is impossible to know whether they truly occurred pre or post clock-change.

On October 'Day 0', the hour from 01:00-01:59 occurs 'twice'. Once as BST and then, as the time reaches 02:00 BST and reverts to GMT, again as GMT. Therefore, there are two hours' worth of collisions recorded within this single hour: A mixture of both pre and post clock-change collisions. Again, these collisions between 01:00-01:59 have been excluded from the analysis on the basis that it is impossible to know whether they occurred pre or post clock-change.

The analysis compares the 336-hour periods (14 days x 24 hours) immediately either side of the clock change. The pre clock change period runs from 01:00 on Day -14 to 00:59 on Day 0. The post clock change period runs from 02:00 on Day 0 to 01:59 on Day 14.

In addition to the total number of PICs occurring in these time periods, the analysis also considers:

- Latitude of the collision location
- Local Authority responsible in the collision location
- Accident severity
- Weather conditions
- Whether any pedestrian casualties were involved

The latitude of collision locations was used to assign collisions to 100km bands in accordance with the Ordnance Survey National Grid reference system. This was because the further north, away from the equator, the collision location is, the greater the impact of darker mornings or evenings might be expected to be. The Local Authority data has similarly been utilised to assign collisions to regions of GB.

Accident severity data has been used to isolate collisions in which at least one casualty has been either killed or seriously injured (KSI).

Collisions have been analysed separately according to whether they occurred in the AM or PM.

Weather conditions have been used to identify whether collisions occurred in 'Fine Weather' or in adverse weather conditions such as rain, snow, fog, high winds etc.

Throughout the analysis, any records which were incomplete or where the pertinent data fields were marked as being either 'Unknown' or 'Data missing or out of range' were completely excluded[1].

It should be noted that no adjustment has been made for, or account taken of, varying traffic levels either by location or time. No account has been taken of school term times.

Results

Overall

On average, there are 204 more personal injury collisions per year in the two fortnights following the clock changes than in the fortnights preceding them: An increase of 2.0%.

In spring, the number of collisions following the clock change actually reduces. There are 74 fewer collisions per year in the fortnight after the clocks go forward for the start of BST – a decrease of 1.5%. However, the reduction in spring is more than outweighed by the increase in autumn. The fortnight after the clocks go backwards for the end of BST sees an annual average increase of 278 collisions – an increase of 5.1%.

[1] A total of 2,910 records were excluded due to missing, incomplete or unknown data. The remaining dataset contained 123,215 records.

Table 1 shows the average annual change in collisions after each of the spring and autumn clock changes, split by whether collisions occur in the AM or PM.

Table 1 - Annual Average Changes by Season and Time of Day

Clock Change	Time of day	Annual crash trend	% variation
Spring	AM	-221	-12.7%
Spring	PM	+148	4.9%
Spring	All Day	-74	-1.5%
Autumn	AM	+76	3.9%
Autumn	PM	+202	5.9%
Autumn	All Day	+278	5.1%
Overall		+204	2.0%

It is interesting to note that the single biggest change occurs in mornings after the start of BST in spring. The impact of the clock change here is that mornings will be darker (although the effect reduces over time) and also that (on Day 0, at least) people may have had one hour's less sleep than usual. It is noteworthy therefore that the change seen is a 12.7% reduction in the number of PICs, leading to 221 fewer collisions per year in the fortnight following the start of BST. However, this is somewhat offset by an increase in the number of collisions in the spring PM, when evenings are lighter.

The second biggest change shown in Table 1 occurs in the autumn PM. More intuitively than the spring changes, the increase in collisions in the autumn PM correlate with the darker evenings. However, it might also be anticipated that, on average, there would be more adverse weather following the end of BST in autumn than in the spring.

Adverse Weather

The general trend of collisions decreasing after the clocks change in spring and increasing after they change in autumn might be largely explained by the weather: In general, we might expect weather conditions to improve following the spring clock change (moving from late March into April). Conversely, we might anticipate weather conditions to worsen following the autumn clock change (moving from late October into November).

Table 2 shows that the number of collisions involving adverse weather conditions decreases following the start of BST and increases following the end of BST, as expected. What's more, these changes are of a very similar scale to the overall changes for each clock change shown in Table 1 above.

Table 3 demonstrates that the number of collisions involving adverse weather conditions as a proportion of the total number of collisions follows the same trend, namely a decrease in spring and an increase in autumn.

Table 2 - Number of PICs involving adverse weather conditions (Annual Average)

Clock Change	Pre Clock Change	Post Clock Change	Difference
Spring	598	530	-68
			-11.32%
Autumn	1,138	1,353	+215
			+18.93%
Overall	1,735	1,883	+148
			+8.51%

Table 3 - Proportion of PICs involving adverse weather conditions

Clock Change	Pre Clock Change	Post Clock Change	Change in rate (Percentage points)
Spring	12.53%	11.29%	-1.24%
Autumn	21.08%	23.84%	+2.76%
Overall	17.07%	18.16%	+1.09%

Pedestrians

In the fortnight following the start of BST, there are, on average, 115 fewer collisions involving a pedestrian casualty – a reduction of 13.4% compared to the previous fortnight. However, the precise opposite is true when BST ends. In the fortnight following the end of BST, there are, on average 102 more collisions involving pedestrian casualties than in the preceding fortnight – an increase of 11.3%.

This trend is not just a reflection of the overall changes in the total number of collisions. The proportion of collisions in which a pedestrian is injured follows the same pattern. In the fortnight following the start of BST the proportion of collisions involving a pedestrian casualty decreases by 2.16 percentage points. Whereas, in the fortnight following the end of BST, the proportion of collisions which involve a pedestrian casualty increases by 0.98 percentage points.

Table 4 - Number of PICs involving a pedestrian casualty (Annual Average)

Clock Change	Pre Clock Change	Post Clock Change	Difference
Spring	855	741	-115
			-13.4%
Autumn	908	1,011	+102
			+11.3%
Overall	1,763	1,751	-12
			-0.7%

Table 5 - Proportion of PICs involving a pedestrian casualty

Clock Change	Pre Clock Change	Post Clock Change	Change in rate (Percentage points)
Spring	17.93%	15.77%	-2.16%
Autumn	16.83%	17.81%	+0.98%
Overall	17.35%	16.89%	-0.46%

Severity

In the fortnights following both the spring and autumn clock changes, there is a small reduction in the number of KSIs in the morning but a slightly larger increase in the number of KSIs in the afternoon. Overall, therefore, there is an increase in the number of KSI collisions following both clock changes: 58 per annum on average, spread across both fortnights following clock changes. This equates to an increase of around 2 casualties per day.

However, Table 7 shows that there is very little change in the severity index following either clock change indicating that the proportion of collisions in which somebody is either killed or seriously injured is similar both before and after the clock changes.

Table 6 - Number of PICs in which somebody is killed or seriously injured - KSIs (Annual Average)

Clock Change	Time of day	Pre Clock Change	Post Clock Change	Difference
Spring	AM	254	245	-9
Spring	PM	503	526	24
Spring	All Day	757	771	15
Autumn	AM	314	312	-2
Autumn	PM	553	599	46
Autumn	All Day	868	911	43
Overall		1,624	1,682	58

Table 7 - Severity index

Clock Change	Time of day	Pre Clock Change	Post Clock Change	Change in Severity Index (percentage points)
Spring	AM	14.63%	16.16%	1.54%
Spring	PM	16.57%	16.54%	-0.03%
Spring	All Day	15.86%	16.42%	0.56%
Autumn	AM	16.16%	15.44%	-0.71%
Autumn	PM	16.03%	16.39%	0.36%
Autumn	All Day	16.07%	16.05%	-0.02%
Overall		15.98%	16.22%	0.24%

Geographic Variation

Results by latitude banding in Table 8. Results by region (in alphabetical order) in Table 9.

Table 8 - Results by latitude

Description of approximate area covered	**Net annual crash trend after March change**	**Net annual crash trend after October change**	**Net annual crash trend after both changes**	**% crash variation after both changes**
Caithness & Northern Isles	-0	+1	+1	---
Grampian, Sutherland & W Isles	+5	+6	+12	+19.9%
Tayside, Fife & Trossachs	+1	+9	+10	+16.3%
Glasgow, Edinburgh & Borders	+6	+30	+36	+7.8%
N England & SW Scotland	-7	+9	+2	+0.5%
Lancashire, Yorkshire & Humberside	-6	+15	+9	+0.7%
N and E Midlands & N Wales	0	+72	+72	+4.2%
W and S Midlands & S Wales	-2	+32	+31	+1.8%
London, S England, Kent & Severn	-64	+99	+35	+0.9%
SW England & Channel Coast	-8	+3	-4	-1.1%
TOTAL	**-74**	**+278**	**+204**	**+2.0%**

Table 9 - Results by region

Region	Net annual crash trend after March change	Net annual crash trend after October change	Net annual crash trend after both changes	% crash variation after both changes
North East Scotland	+5	+8	+13	+34.21%
East Scotland	+11	+24	+35	+14.61%
South Wales	+5	+9	+13	+7.85%
Highlands and Islands	+2	+2	+4	+7.59%
North Wales	-2	+6	+5	+5.34%
West Midlands	+17	+22	+39	+4.55%
East Midlands	-8	+41	+33	+4.51%
North West England	-7	+41	+34	+3.39%
North East England	+1	+10	+10	+2.72%
South West Scotland	-6	+12	+7	+2.44%
East of England	-4	+16	+12	+1.21%
South West England	+6	+3	+10	+1.17%
Mid and West Wales	+1	0	+1	+0.95%
South East England	-16	+20	+4	+0.22%
London	-62	+54	-8	-0.44%
Yorkshire and the Humber	-17	+11	-6	-0.59%
Total	**-74**	**+278**	**+204**	**+2.01%**

Summary

The fortnight following the start of BST sees a slight decrease (1.5%) in the number of PICs, split between a decrease in the AM which is somewhat offset by an increase in the PM. Whereas, the fortnight following the end of BST sees a more sizable increase (5.1%) in the number of PICs, both in the AM and PM. However, the scale of these overall changes in the number of PICs (reduction in spring and increase in autumn) is very similar to the changes seen in the number of PICs occurring in adverse weather. It might be that the changes are as much due to weather conditions as they are to light conditions.

Both the number and proportion of PICs which involve a pedestrian casualty decrease in the fortnight following the start of BST and increase in the fortnight following the end of BST.

The number of KSI collisions increases very slightly in the fortnight following the start of BST, and sees a somewhat greater increase in the fortnight following the end of BST. But the severity index, in autumn in particular, is very similar both before and after the clock change, indicating that the increase in KSIs is largely matched by a proportionate increase in the number of slight injury collisions.

Considering the geographical variation – For the fortnight following the start of BST, generally there is a pattern of increases in the number of PICs further north and decreases in the number of PICs further south. In the fortnight following the end of BST, all bands and all regions show an increase in the number of PICs. The overall percentage change in PICs, taking account of both the start and end

of BST, shows a broad correlation with geography – The further north, the greater the increase in PICs.